VOL. VI, No. 1 JANUARY, 1951

AGRICULTURAL CHEMICALS

killing power

...THAT'S THE THING!

This slogan symbolizes what we sell. Today, *effectiveness* of the materials you use is more important than ever before.

POWCO BRAND insecticide concentrates provide proven dependability, trouble-free formulation and tested killing power.

POWCO

KILLING POWER—THAT'S THE THING!

John Powell & Co., Inc.

ONE PARK AVENUE, NEW YORK 16, N. Y.

Sales Offices: Philadelphia • Pittburgh • Huntsville • Chicago • Fort Worth • Denver • San Francisco
Canada: Charles Albert Smith, Ltd., Toronto, Montreal • Argentina: John Powell y Cia
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ALLETHRIN • DDT • CHLORDANE • PYRETHRUM & PYRIN • PIPERONYL BUTOXIDE
ROTENONE • SABADILLA • ANTU • 2,4-D & 2,4,5-T • BHC • LINDANE • TOXAPHENE

The new year brings many problems . . . for our country . . . for industry . . . for agriculture. They can and will be met through extraordinary cooperation from all loyal Americans.

To this end Potash Company of America pledges its best efforts.

POTASH COMPANY OF AMERICA
Carlsbad, New Mexico

GENERAL SALES OFFICE . . . 50 Broadway, New York, N. Y.
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ATTACLAY "reasons why"
Third of a series

WHEN YOU FORMULATE TOXAPHENE . . .

let ATTACLAY smooth the rough spots

Attaclay has what toxaphene needs—great sorptive capacity and over-all efficiency. That's why a 40% base on Attaclay is still a dry, free-flowing powder—readily handled in the plant, highly acceptable to blenders.

With toxaphene, as with all the popular poisons, Attaclay shows across-the-board flexibility. It is equally effective in straight toxaphene dusts, toxaphene-sulfur cotton insecticides, 25 and 40% wettable powders for animal spray work. It is self-recommending for use as extender or conditioner to prepare field strength toxaphene dusts that spread uniformly from ground rig or plane.

As a measure of trade satisfaction, we estimate that better than five-sixths of the toxaphene going into dust concentrates and wettable powders is formulated with Attaclay. You can draw forceful conclusions from such a vote of confidence.

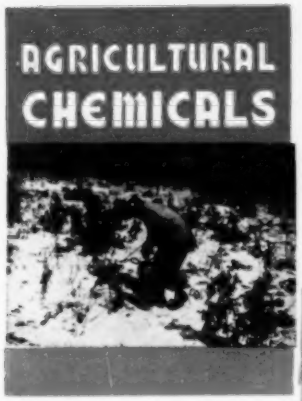
May we work with you?

DUSTS VS. SPRAYS

In cotton insect control, there is less likelihood of spider build-up with a dusting program.

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Phila. 5, Pa.



THIS MONTH'S COVER

Five years of testing have indicated that basal bark treatment of brush and small trees is as effective as conventional foliate applications of weed killers. This method is applicable over the entire year, compared to less than half the year by foliage treatment. Both 2,4-D and 2,4,5-T are used. (Photo by Dow Chemical Co.)

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A Monthly Magazine For the Trade

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THOMAS MORGAN
Advertising Manager

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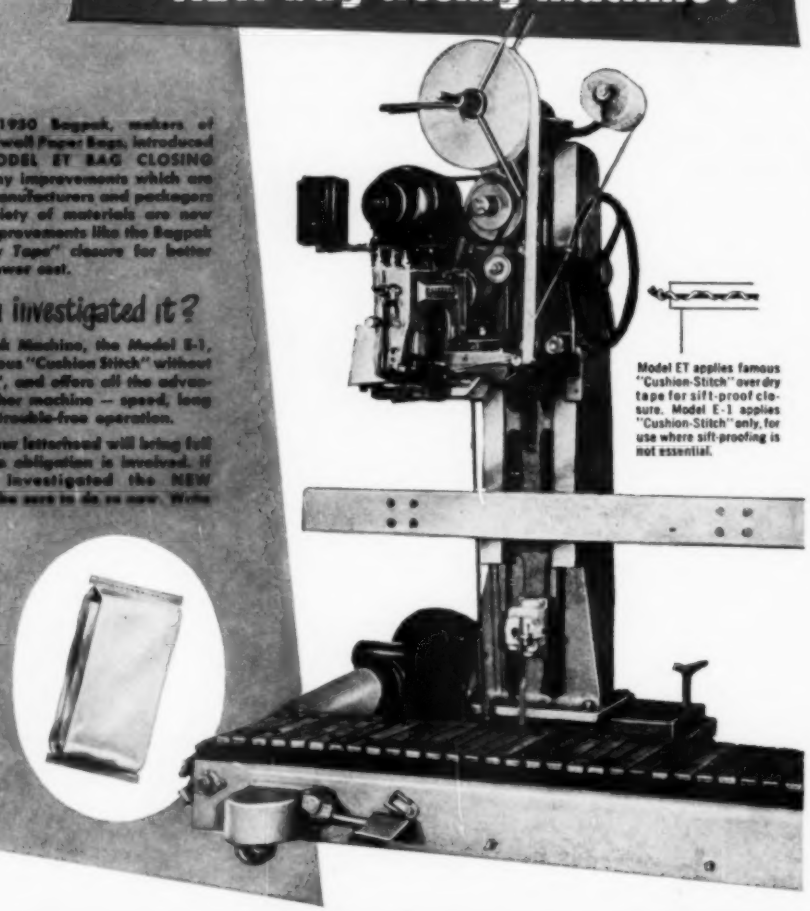
In the year 1930 Bagpak, makers of Bagpak® Multiwall Paper Bags, introduced the NEW MODEL ET BAG CLOSING MACHINE. Many improvements which are important to manufacturers and packagers of a wide variety of materials are now available — improvements like the Bagpak sewn-thru "Dry Tape" closure for better protection at lower cost.

Have you investigated it?

Another Bagpak Machine, the Model E-1, applies the famous "Cushion Stitch" without the "Dry Tape", and offers all the advantages of the other machine — speed, long life, easy and trouble-free operation.

A request on your letterhead will bring full information. No obligation is involved. If you haven't investigated the NEW BAGPAKERS®, be sure to do so now. Write today.



Model ET applies famous "Cushion-Stitch" over dry tape for sift-proof closure. Model E-1 applies "Cushion-Stitch" only, for use where sift-proofing is not essential.

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NOW... IMPROVED SOLVENTS FOR YOUR

Bug Killers!

S/V SOVACIDES Available for All Types of Insecticidal Preparations

From now on, you can get even better aromatic oil solvents for your insecticides – to make them even more effective for both outdoor and indoor use.

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Get full facts about these proved products from your S/V Process Products Representative.

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COTTONY CUSHION SCALE
COTTONY PEACH SCALE
CUCUMBER BEETLE
DIAMONDBACK MOTH
FIG SCALE
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FLORIDA RED SCALE
FORBES SCALE
GRASSHOPPERS
GREENBUG
GREEN JUNE BEETLE GRUBS
LEAF FOLDER
LEAFHOPPERS
LEAF MINER
LEAF ROLLERS
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MAGGOT
MEALYBUGS
MEALY PLUM LOUSE
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Manufacturers of Thiophos® Parathion Technical
Agricultural Chemicals Division
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and the right way

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- Saxolin open mesh bags
- paper and Multiwall bags
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SINCE 1847

Choose Chase for all 5 features

Drawing names out of a hat may be one way to make a decision. But in buying bags we feel sure that you'll want to choose the container that assures the best protection for your product, the best acceptance of your product. Call in your Chase Salesman. He's technically trained to analyze your needs . . . he's supported by more than 100 years of experience in providing better bags for American industry and agriculture.

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DETHMOR... A WARFARIN CONCENTRATE

The word *sensational* describes the public acceptance of warfarin rodenticides. Warfarin has been widely described, including the fact that both rats and mice are controlled. The next step is to report what enthusiastic users say—

EFFECTIVENESS

"We have used this .5% concentrate on four farms and in every case, the results were very good. One man felt that he completely eliminated a large number of rats in his poultry house and silo pit; another reported very good results around his corn crib and poultry house; another man, who lives near a city dump felt that warfarin was very effective. From many observations, the concentrated baits containing warfarin are much more effective than many of the other rodenticides we have used in the past."

CONTINUOUS CONTROL

"We feel the placement of permanent baits

"The control is so good, however, and so much better than what anyone has ever been accustomed to that we have no dissatisfied customers, either in service or sales. Its absence of bait-shyness makes it the outstanding discovery of all time for rat and mouse control."

NO BAIT SHYNESS

is an outstanding feature of our warfarin rodenticide and our instructions suggest the continuous maintenance of bait as a preventive measure against reinfestation. The value of this procedure has been evidenced in several cases where the premises are still free of rodents several months following initial kill."

WARFARIN--
a new method of rodent control

DETHMOR--
death to mice and rats

Write for our DETHMOR booklet

S. B. PENICK & COMPANY

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Chemical Fertilizers

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- ✔ Available in large volume the year 'round.
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World's largest rice growing, milling, storage and marketing organization.

World's largest year 'round supplier of rice hulls to fertilizer manufacturers.

Announcing

THE NAC LAW GUIDE

NAC's "Guide to Laws Affecting Insecticides, Fungicides, Herbicides, Rodenticides and Related Products" is being revised and expanded. This is the most comprehensive compilation of laws affecting the Industry.

Several new sections have already been sent to members, the others will reach them early this year.

Sections include:

Model State Act
State Synopsis
Residue Tolerances
Pharmacy and Poison Laws
State Registration Requirements
Special Labeling Requirements
Food, Drug and Cosmetic Act
Federal Insecticide, Fungicide and Rodenticide Act
Special Laws Affecting the Sale of Individual Products
Law Chart Citing all Legislative and Regulatory References

The Law Guide is typical of the many services available to NAC Members.

Membership in NAC is an investment which pays.

National Agricultural Chemicals Association

Barr Bldg., 910 17th St., N.W. Washington 6, D. C.

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METACIDE* CONTROLS WIDE RANGE OF INSECTS

HERE'S important news about METACIDE, the *new, powerful, safer-to-use* organic phosphate insecticide recently introduced to American Agriculture.

Extensive field research has demonstrated that METACIDE controls an exceptionally *wide range* of insects. This broad coverage makes METACIDE one of the most *versatile* and *useful* insecticides in existence, especially when you consider these additional important advantages: 1 Strength equal to Parathion, but less toxic to mammals. 2 Easy-to-use liquid concentrate forms collodial suspension in water . . . no powder to handle. 3 Easy to use in high or low pressure equipment.

Write for Detailed Information, Now Available in Metacide Technical Bulletin

*METACIDE is a trade mark of Chemagro Corporation, New York, N.Y.

AGRICULTURAL CHEMICAL DIVISION
6505 Empire State Building, 305 Fifth Ave., New York, N.Y.

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PITTSBURGH COKE & CHEMICAL CO.
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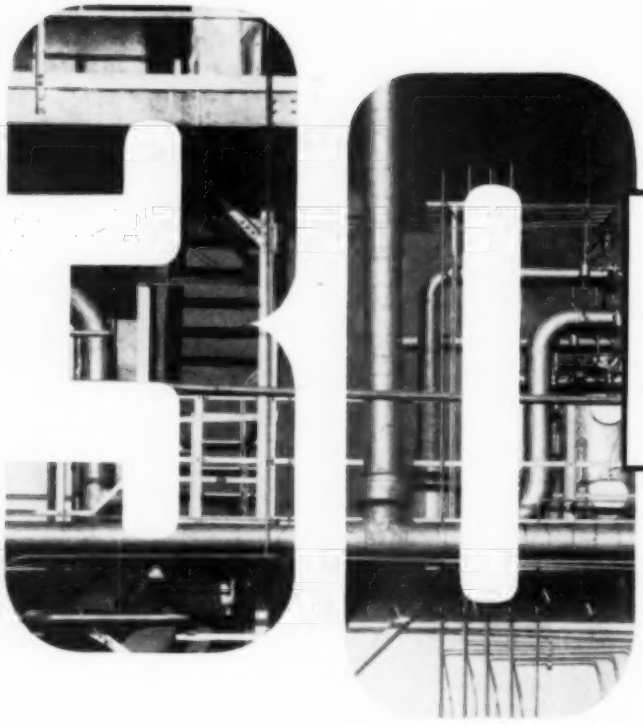


30 YEARS' EXPERIENCE YOU CAN USE

MATHIESON CHEMICAL CORPORATION, Pasadena, Texas, is using a Monsanto-designed contact sulfuric acid plant, rated at 400 tons daily. It has operated efficiently at more than 500 tons daily. The photo shows portions of the combustion chamber and connecting pipe.

Whether you are planning to start producing your own sulfuric acid or thinking of expanding your present plant, you can use Monsanto's 30 years' experience. Why not consult Monsanto? See what you can gain from Monsanto's three decades of experience in designing, building and operating contact sulfuric acid plants.

Monsanto-designed plants, with their many exclusive features, give you the following important advantages:

1. **CAPACITY** to meet your needs . . . ranging from five to five hundred tons of acid (100% H_2SO_4 basis) daily, with no equipment in parallel.

2. **FLEXIBILITY** in operation from 30% of capacity to more than rated capacity without "blanking off" or other operations that consume time and labor.

3. **EFFICIENCY and ECONOMY.** Monsanto-designed plants deliver top efficiency with low costs of operation and maintenance. They produce by-product steam that means further savings.

More than 250 Monsanto-designed sulfuric acid plants are serving industry throughout the world. Many of them have paid for themselves in savings. In addition, their owners have gained control of their supply of vital sulfuric acid.

At your request, and without obligating you or your company, a Monsanto representative will call on you with complete information. Write, telephone or wire MONSANTO CHEMICAL COMPANY, Engineering Sales Department, 1700 South Second Street, St. Louis 4, Missouri.

MONSANTO VANADIUM CATALYST, used in producing more than 40% of the world's sulfuric acid by the contact method, is employed in more than 250 plants in 28 countries. Monsanto's vanadium catalyst is highly efficient, rugged, long-lasting. Write for technical information.

MONSANTO
CHEMICALS for PLASTICS

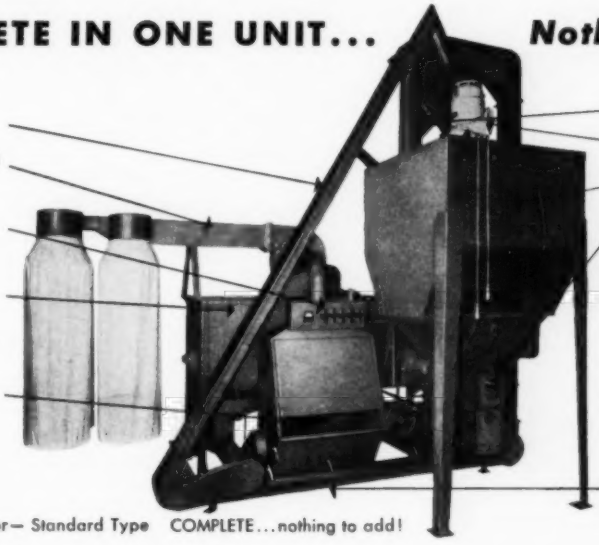
SERVING INDUSTRY . . . WHICH SERVES MANKIND

A. E. Poulsen & COMPANY

For Mixing and Packaging Insecticides...

R.T.R.* UNI-BLENDOR

COMPLETE IN ONE UNIT... Nothing to add



Uni-Blendor— Standard Type COMPLETE...nothing to add!

*Ready to Run...and ready to earn

The R. T. R. Uni-Blendor offers all of the advantages of big plant operation at small plant cost. The equipment is designed by recognized specialists on insecticide mixing and blending. Three types are manufactured, each to provide for a specific production requirement.

UNI-BLENDOR—*Standard Type*... Designed to mix and blend dust concentrates with diluents to produce a finished, ready to use, field strength product. Requiring only 9'x 12' of floor space and 13' of head room, the equipment can be readily installed in existing buildings. The Uni-Blendor, Standard Type, produces up to four 40 cu. ft. batches per hour. The unit is complete with nothing to add and is "Ready to Run" productively and profitably within 24 hours after delivery.

UNI-BLENDOR—*Hi-Capacity Type* ... Designed for the same processing operation as the Uni-Blendor, Standard Type. Incorporating all of the distinct advantages of the Standard Type and requiring only 12' x 15' of floor space and 15' of head room, it produces up to seven 40 cu. ft. batches per hour.

UNI-BLENDOR—*Dual Type*... Designed to reduce technical grade toxicants to a dust base concentrate form. This type, which requires only 11' x 11' of floor space and 15' of head room, produces as many as three 40 cu. ft. batches per hour.

Liquid injection systems can be provided for all three types of the R. T. R. Uni-Blendor at additional cost.

The Uni-Blendor is plant tested before shipping and is "Ready to Run" and ready to earn within 24 hours after receipt. The R. T. R. Uni-Blendor eliminates excessive capital investment, costly experimenting, expensive engineering, remodeling of buildings and long delays, all of which are involved in custom built installations. Shipped in sections which any mechanic can assemble, the Uni-Blendor is ready to operate immediately after making the electrical connection to the plant circuit.

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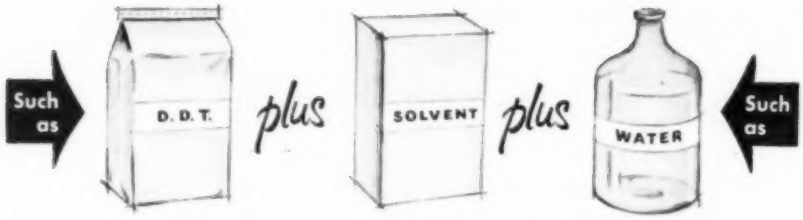
Los Angeles 65, Calif.

Please send me more information on Uni-Blendor
☐ Standard ☐ Hi-Capacity ☐ Dual

Name.....
Firm Name.....
Street Address.....
City.....Zone.....State.....

MANY UNMIXABLES
do mix



. . . . with the help of an
ANTARA®
SURFACTANT

Many "unmixable" combinations are readily combined—to form stable and uniform fluids, lotions, creams or sprays – with the help of a **SURF**ace **ACT**ive **AGENT**. The new, or improved products, act more quickly – more thoroughly – or for a longer period of time. They are thus easier to sell; they frequently cost less to make.

Some thirty industries – including the agricultural, insecticide, rubber, petroleum and textile fields—have profitable uses for Antara surfactants.

Extensive research staffs and facilities support the development and application of Antara surfactants—available to help you improve an existing product or develop a new one. Your inquiry is invited – without obligation. It will bring a prompt opinion as to whether one of the Antara surfactants may be adaptable to your needs. Kindly address your inquiry to Department 16.

....One *new* business card now bears *two* familiar names

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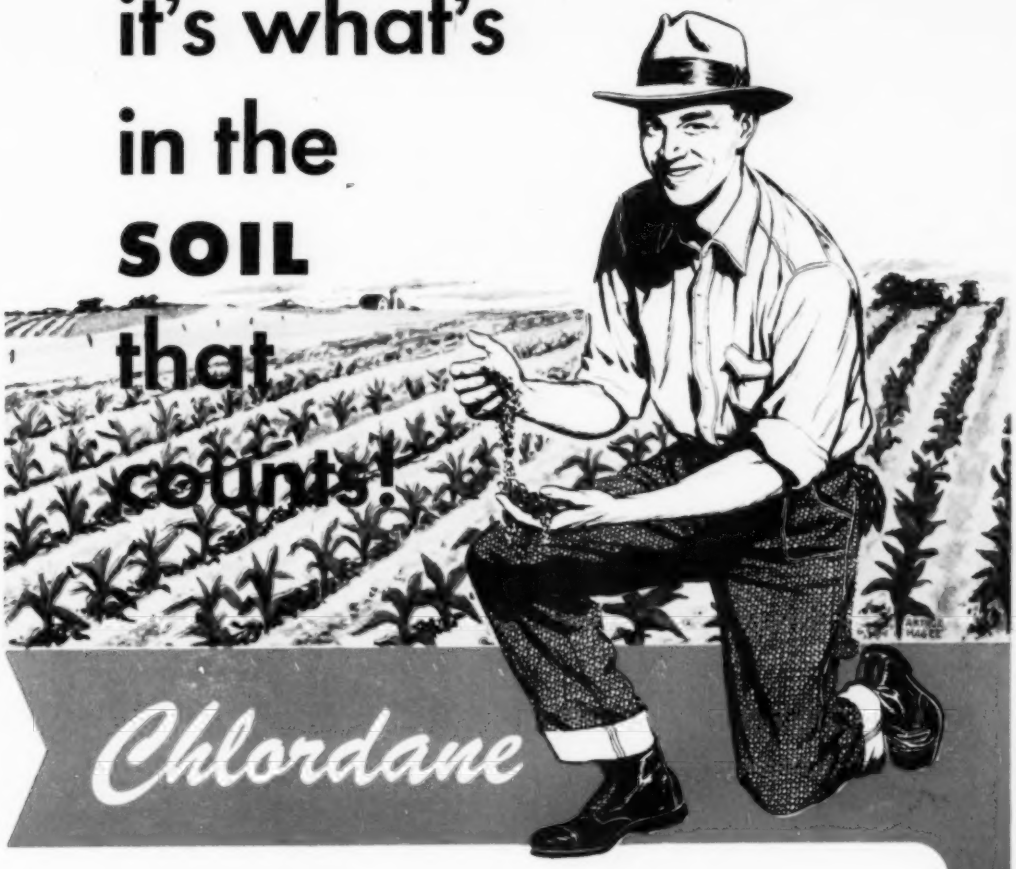
BRANCHES
Boston • Providence • Philadelphia • Charlotte, N. C. • Chicago • Portland, Ore. • San Francisco
IN CANADA: Chemical Developments of Canada Limited, Leaside, Toronto 17

it's what's in the SOIL that counts!



Chlordane

the all around insecticide!

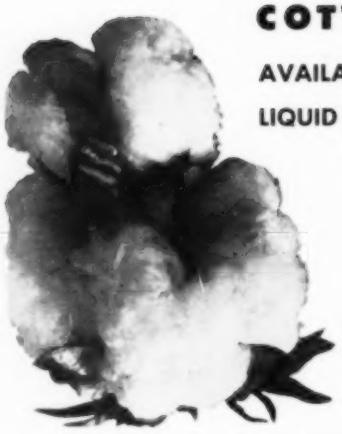
There's an old saying "There's more to it than meets the eye." And in the proper control of soil borne insects this certainly rings true. For subterranean pests such as wire worms, southern corn root worms, seed corn maggots, and grubs, annually destroy valuable acreages of corn, potatoes, sugar cane, etc.

Chlordane has proved commercially that it is an oustanding control agent of soil borne insects. Applications of chlordane dusts, wettable powders, or emulsifiable concentrates are often the determining factors between success or failure of a crop.

Remember, chlordane is an all around insecticide capable of controlling a variety of insect pests. For additional information concerning proper formulations and applications, write to:

VELSICOL CORPORATION
330 EAST GRAND AVENUE • CHICAGO 11, ILLINOIS
Representatives in principal cities

153 items you can for your 1951



COTTON POISONS

AVAILABLE IN DUSTS AND LIQUID FORMULATIONS

- 44 Aldrin
- 44 Dieldrin
- 44 Toxaphene
- 44 Benzene Hexachloride
- 44 Chlordane

Formulated in any combinations to suit the recommendations of yourself, your customers and your county agent.

CATTLE SPRAYS

- 44 Gold Star Livestock and Barn Concentrate
- 44 Stock and Barn Insect Killer
- 44 Dairy Spray
- 44 Grub Dust
- 44 Ben-Hex 10
- 44 Sheep Dust

BRUSH KILLERS

- 44 Brush Murder (2,4-D and 2,4,5-T)
- 44 Hi-Strength Brush Murder
- 44 2,4,5-T Concentrate

TOXAPHENE

- 44 Emulsifiable Toxaphene Concentrate
- 44 Super Toxaphene Concentrate
- 44 Toxaphene Oil Concentrate
- 44 Cotton Dust 20-40
- 44 10% Toxaphene Dust
- 44 20% Toxaphene Dust
- 44 Wettable Toxaphene Powder

WHEAT CHEMICALS

- 44 2,4-D Weed Killers
- Toxaphene Emulsifiable Concentrates and Dusts
- 44 Chlordane Emulsifiable Concentrates and Dusts
- 44 Parathion Emulsifiable Concentrates and Dusts
- 44 Tepptone Emulsifiable Concentrates and Dusts

CORN INSECTICIDES

- 44 25% DDT Emulsion Concentrate
- 44 DDT Wettable Powder
- 44 Parathion Emulsifiable Concentrate
- 44 Tepptone Emulsifiable Concentrate and Dusts

select from stock... buy now!

HOUSEHOLD SPRAYS

- 44 Kilzit (Containing Chlordane)

  Available in pints, quarts, gallons, 5-gal. pails, 30 and 55 gal. drums. A 2% Chlordane in refined oil base.

CHLORDANE PRODUCTS

- 44 Emulsifiable Chlordane Concentrate
- 44 Super Chlordane Concentrate
- 44 Chlordane Oil Concentrate
- 44 5% Chlordane Dust
- 44 Wettable Dust Concentrate

DDT PRODUCTS

- 44 25% DDT Emulsion Concentrate
- 44 DDT Wettable Powder
- 44 DDT Dust Concentrate
- 44 DDT Cotton Dust 3-5-40
- 44 5% DDT Dust
- 44 Potato Dust 5-90
- 44 Potato Dust 10-80

COLORADO 44 BRAND

GARDEN INSECTICIDES

- 44 Octakill
- 44 Emulsifiable Concentrate
- 44 Chlordane Dust

2,4-D PRODUCTS

- 44 2,4-D Weed Killer Liquid Amine Concentrate
- 44 Butyl Ester 2,4-D
- 44 Isopropyl Ester 2,4-D
- 44 Aero Butyl Ester
- 44 Super "80" Butyl Ester

CHEMICAL CORPORATION OF COLOLADO

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Denver 4, Colo.

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Rush price list and full information on all Colorado •44 products and the Colorado •44 Early Buying Plan.

NAME_____

ADDRESS_____

CITY_____ STATE_____

The American cotton planter was "too late with too little" this past season.

Cultivating, flame weeding and spraying in one operation. Courtesy Delta Experimental Station, Stoneville, Miss.

There is no universal pump for all cotton spraying — but *bronze pump construction* has been recommended by the leading manufacturers and formulators of the many chemicals used in cotton spraying. Oberdorfer has been making bronze pumps continuously and in quantity since 1896.

Special packing and lubrication are required to resist the solvent action of the ever-present aromatic oils. Oberdorfer has had much experience pumping the aromatics since 1914.

Wide range in pump capacity must be available depending on locally proven cultural practices. These vary throughout the cotton area in gallons per acre, choice of spray materials, pump pressures and sources of power available. Oberdorfer has produced thousands of different bronze gear type pumps for specific purposes in the last 50 years.

The new Oberdorfer bronze pumps designed for cotton spraying cover the demands of the field from one end of the cotton belt to the other on ground apparatus and for aeroplane application.

● Fill in the following form and coupon and we will send you without charge, of course, the number and size of Oberdorfer Bronze Pump best suited for cotton spraying in your area.

Agricultural Pump Div., Dept. AC-511
Oberdorfer Foundries, Inc.
Syracuse, N. Y.

Name_____

Address_____

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Number of rows sprayed (1, 2, 4, or 8) _____

Number of nozzles per row (1, 2, or 3) _____

Nozzle pressure required (pounds per square inch) _____

Is agitation of chemical formulation required? _____

Source of power (direct tractor PTO, pulley drive, gas engine) _____

RPM of pump shaft during spraying _____

Average miles per hour of spray rig _____

OBERDORFER BRONZE Rotary Gear Pumps

ALDRIN

Nemesis of Boll Weevil

Boll Weevil has been working the cotton fields of the United States since 1892 when it first appeared in Southernmost Texas, an emigrant from its original home in Mexico. From that time on this pest has taken a tremendous toll throughout the South in reduced cotton crops, depreciated land values, abandoned farms, closed gins and oil mills and has been the cause of many other general economic disturbances. These losses all have had their inception in the attack of Boll Weevil on the squares and bolls of the cotton plant.

Over the years a large number of cotton poisons have been used with varying success to stop the Weevil. Last year ALDRIN stood out as the foremost killer of Boll Weevil and many other cotton pests, even under adverse weather conditions. As a result, ALDRIN is widely recognized as one of the most potent weapons against these destructive insects. This year when increased production of cotton is vital to America's defense program, low cost ALDRIN dusts and sprays will be in greater demand; although the supply of ALDRIN will be larger, in order to avoid disappointments, we urge you to prepare now to have a sufficient stock of ALDRIN insecticides in your dealers' hands in advance of the season for four applications. Write us for ALDRIN and DIELDRIN circulars. Complete information on request.

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...and you can get it now!

For many years, growers have used *Kryocide* Natural Cryolite insecticide in the control of many chewing insects. And today more than ever, they will look to *Kryocide* as a dependable protector of their crops—since it won't sterilize soil, harm crops for which it is intended, or upset natural insect balance.

✓ **READILY AVAILABLE**—*Kryocide* is a *natural* product, not presently dependent upon "critical" raw materials.

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✓ **COMPATIBLE** with most other insecticides and fungicides.

✓ **MICRON-SIZED** for maximum deposit with uniform coverage.

✓ **USE-TESTED** . . . proved to be economical and effective.

You can depend on Pennsalt insecticides, because they're backed by over a 100 years of experience in chemical manufacturing. Write, wire or call Agricultural Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas; Berkeley and Los Angeles, California; Portland, Oregon; Montgomery, Alabama.

KRYOCIDE controls many crop pests, including:

Cabbage Worms & Loopers	Mexican Bean Beetle	Cucumber Beetles (Diabrotica)
Grape Leaffolder	Sugar Cane Borer	Velvet Bean Caterpiller
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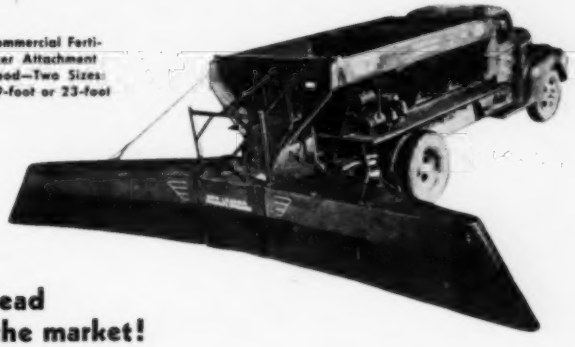
HERE'S THE ANSWER TO YOUR SPREADING PROBLEMS!

AGAIN!
"The NEW LEADER" leads the field



Commercial Fertilizer Attachment Hood—Two Sizes: 19-foot or 23-foot

with its new
"Motor-Driven Spreader"
offering greater accuracy of spread
with the most positive feed on the market!

SPECIAL ADVANTAGES — Uniformity of spread is not dependent on truck speed. Motor is mounted on catwalk and drives only the twin distributor discs at a constant speed, assuring full width of spread at all times together with uniform distribution.

Conveyor is separately driven from truck drive shaft by a series of V-belts to deliver the correct amount per acre—regardless of truck speed or regardless of whether the truck is driven in low, super-low or any other gear.

Conveyor speed is, therefore, positively synchronized with speed of the rear wheels of the truck and at each revolution of the rear wheels, the conveyor moves a given distance regardless of the truck's speed. Amount of material delivered by conveyor does not vary with hilly or soft field conditions.

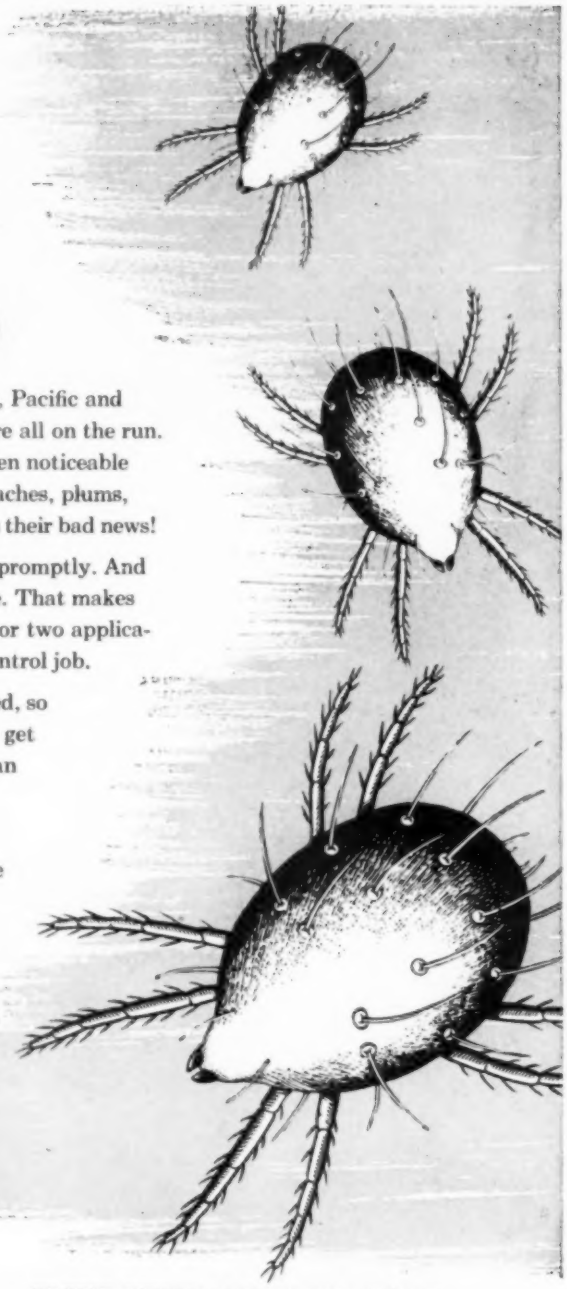
Spreader Body Lengths (inside measure) are 9′, 11′, 13′ and 15′. Other body lengths on special order.

Note: When Spreading Attachment is folded up for road-traveling position, width is approximately 7′-5″.

"The NEW LEADER" Self-Unloading Bulk Transport

The 20-ton capacity transport above is shown with elevator in place and ready to load a NEW LEADER Spreader truck. These units are proving very profitable; in bad weather they eliminate demurrage on railroad cars; fertilizer gets to the job quickly and spreader trucks can be kept working in the field. The transport, being a self-unloading unit, leaves the tractor truck free to return to pick up another transport load. These units have four individual compartments of 5 tons each. Each compartment may be unloaded independently of the others. Compartments and rear endgate are removable so that bagged and packaged goods may be hauled instead of bulk loads. Capacity 5 tons to 25 tons, lengths from 11 ft. to 40 ft. Written warranty with all NEW LEADER equipment. Write today for specifications, prices, etc. Fast delivery service sells fertilizer!

HIGHWAY EQUIPMENT COMPANY, INC. CEDAR RAPIDS, IOWA
MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS



Bad News

FOR THE SCHOENE MITE, TOO

European red, Two-Spot, Willamette, Pacific and now even the Schoene mites... they're all on the run. Their build-up in recent years has been noticeable especially on apples, pears, citrus, peaches, plums, walnuts and almonds. But EPN 300 is their bad news!

EPN 300 Insecticide gets after them promptly. And its residual effect lasts for a long time. That makes it tough for mites to come back. One or two applications of EPN per season may do the control job.

Moreover, EPN is highly concentrated, so the orchardist needs little material to get results. With fewer applications and an efficient material to do the job, mite control is now easier.

EPN 300 Insecticide is another of the many outstanding farm chemicals developed by Du Pont to help farmers obtain better pest control.

DU PONT

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DU PONT CHEMICALS FOR THE FARM INCLUDE:

Fungicides: PARZATE® (Liquid and Dry), FERMATE,® ZERLATE,® Copper-A (Fixed Copper), SULFORON® and SULFORON®-X Wettable Sulfurs . . . *Insecticides:* DEENATE® DDT, MARLATE® Methoxychlor, LEXONE® Benzene Hexachloride, KRENITE® Dinitro Spray, EPN 300 Insecticide, Calcium Arsenate, Lead Arsenate . . . *Weed and Brush Killers:* AMMATE,® 2,4-D, TCA and 2,4,5-T . . . Also: Du Pont Cotton Dust, Du Pont Spreader Sticker PARMONE® Fruit Drop Inhibitor, and many others. ® Reg. U.S. Pat. Off.

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

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RAYMOND IMP MILLS

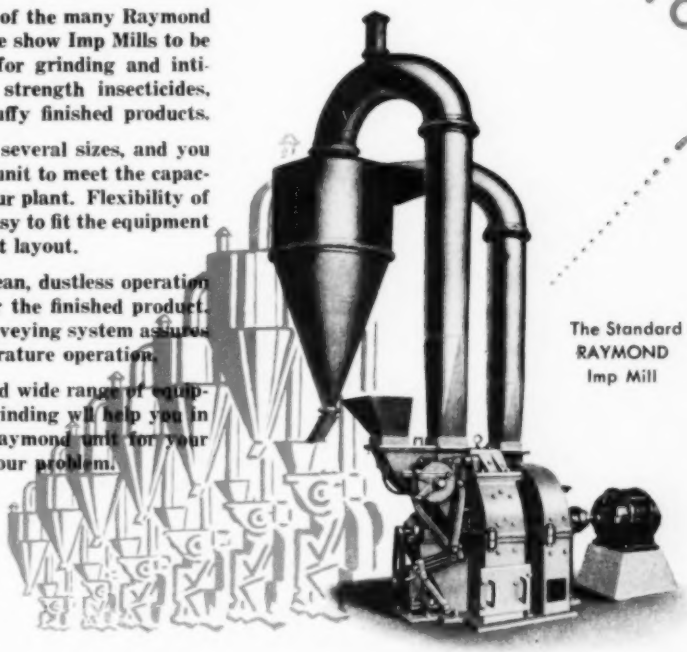
FOR INSECTICIDE PRODUCTION!

The operating records of the many Raymond installations now in use show Imp Mills to be highly efficient units for grinding and intimately blending field strength insecticides, and producing fine, fluffy finished products.

Imp Mills are built in several sizes, and you can obtain a standard unit to meet the capacity requirements of your plant. Flexibility of installation makes it easy to fit the equipment to practically any plant layout.

These units provide clean, dustless operation with close control over the finished product. The air cooling and conveying system assures continuous, low temperature operation.

Our long experience and wide range of equipment for insecticide grinding will help you in selecting the proper Raymond unit for your job. Write us about your problem.



The Standard RAYMOND Imp Mill

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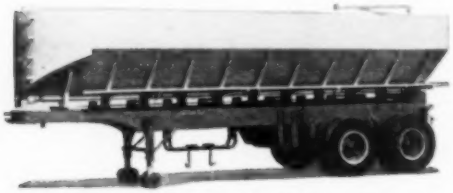
MODEL O-2 ATTACHMENT

spreads rock phosphate faster and more economically than any other method

Specially designed to prevent material from packing and crusting — perfect for spreading rock phosphate, dry powdered lime and other fertilizing materials.

Spreads from 100 to 5000 pounds per acre . . . covers 2 acres for every mile traveled at speeds up to 15 mph. Gives uniform spreads on the level, slopes or hillsides. Spreads 16½ feet widths.

The Model O-2 is 16½' wide . . . folds for highway travel.



"Hi-Speed" Low Cost Transport

For efficient bulk hauling of superphosphate. Positive belt drive conveyor in bottom of body unloads quickly and with minimum agitation. Compartmentized. Waterproof roof can be installed. Standard sizes — no high cost of special construction.

BAUGHMAN also builds bodies for hauling rock phosphate, limestone and other commercial fertilizers. A model for your every need.

Model 235 Holds Spreads to the Ground

For Model K, K-2 and K-3 Bodies . . . prevents wind from scattering spreads. Confines air blast from distributor . . . directs materials outward and groundward. Causes the spread to LAY and STICK. Spreads limestone up to 30 feet . . . phosphate and other fertilizers up to 20 feet. Opens to 18 feet quickly and easily . . . folds for highway travel.

Model Q Portable Conveyor

Loads and unloads from the horizontal to 60°. Capacity up to 40 bu. per minute. Big 9" conveyor screw handles any dry, powdered or granular materials. Available with or without wheels — hundreds of applications.

WRITE . . for complete details of BAUGHMAN fertilizer handling and spreading equipment.

USUALLY DELIVERED FROM STOCK

BAUGHMAN MANUFACTURING CO., Inc.
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"The Pioneers of the Fertilizer Spreading Industry"

Mesquite's

HONEY MESQUITE flourishing on rangeland (above) . . . mesquite after 2,4,5-T application (below).

Master...2,4,5-T

Honey mesquite, the thorny shrub that infests 75,000,000 acres of rangeland in the Southwest, has met its master in formulations of 2,4,5-T.

In experiments to exterminate mesquite in Texas, thousands of chemicals were tried in an effort to discover an effective weapon against it. Monsanto participated in these tests. After three years of testing 2,4,5-T formulations, authorities have recommended these materials as the only large-scale control agents acceptable from all standpoints.

2,4,5-T must be applied by experienced people using proper equipment. Employing it this way, 2,4,5-T can control mesquite for as much as 5 years or more at an economical cost.

Monsanto manufactures 2,4,5-T acid for preparing mesquite control formulation. Like many other herbicidal and insecticidal chemicals, 2,4,5-T is now in short supply. For further information on the use of 2,4,5-T or other Monsanto chemicals, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

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ortho-DICHLOROBENZENE (Commercial Grade)
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HERBICIDAL CHEMICALS
2,4-D ACID 2,4-D SODIUM SALT
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2,4,5-T ISOPROPYL ESTER
SANTOBRITE® (Sodium Pentachlorophenate, Tech.)
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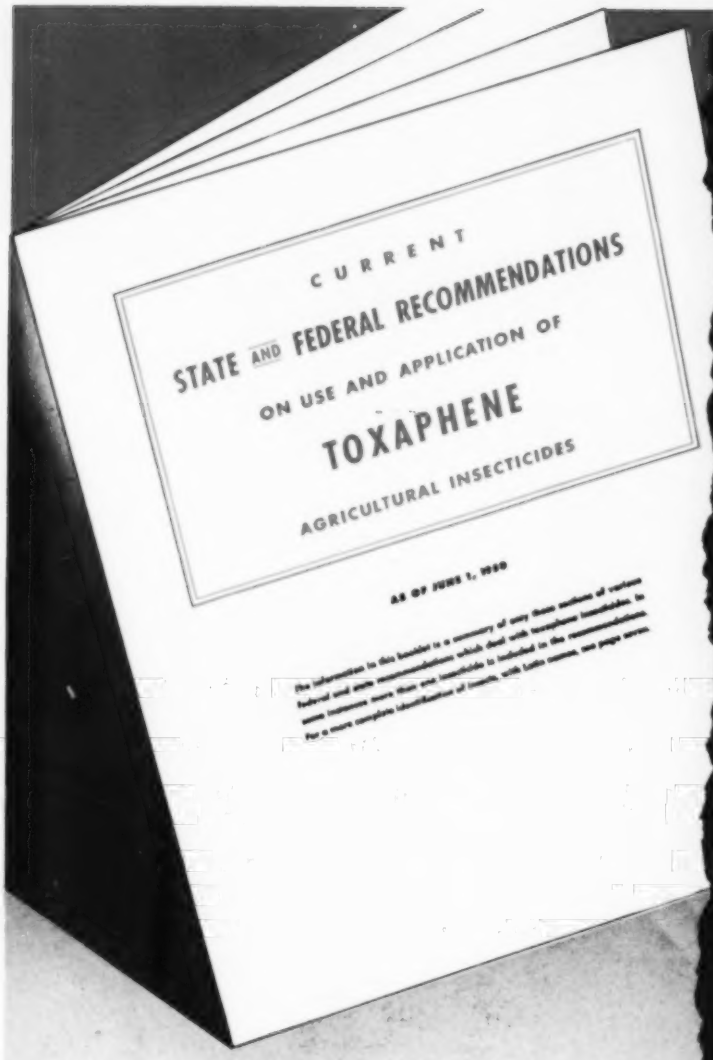
SERVING INDUSTRY . . . WHICH SERVES MANKIND



Toxaphene Will Kill These Pests

ALFALFA WEEVIL
ARMYWORM
ASH-GRAY BLISTER BEETLE
ASTER LEAF MINER
BLACK BLISTER BEETLE
BLACK CUTWORM
BOLL WEEVIL
BOLLWORM
CARAGANA BLISTER BEETLE
CAROLINA GRASSHOPPER
CATTLE-BITING LOUSE
CATTLE TICK
CHINCH BUG
CLEAR-WINGED GRASSHOPPER
CLOVER SEED CHALCID
COTTON APHID
COTTON FLEAHOPPER
COTTON LEAFWORM
DIFFERENTIAL GRASSHOPPER
EAR TICK
FALL ARMYWORM
GARDEN WEBWORM
GRANULATE CUTWORM
GRAY BLISTER BEETLE
GREEN CUTWORM
GULF COAST TICK
HAIRY CHINCH BUG
HOG LOUSE
HORN FLY
LESSER MIGRATORY GRASSHOPPER
LINED SPITTLEBUG
LITTLE FIRE ANT
LONE STAR TICK
LONG-NOSED CATTLE LOUSE
LYGUS
MEADOW SPITTLEBUG
MILLIPEDES
MORMON CRICKET
NUTTALL BLISTER BEETLE
PACKARD GRASSHOPPER
PEANUT (POTATO) LEAFHOPPER
PEAR PSYLLA
PEAR THRIPS
PINK BOLLWORM
RAPID PLANT BUG
RED GOAT LOUSE
RED-LEGGED GRASSHOPPER
SALT-MARSH CATERPILLAR
SERPENTINE LEAF MINER
SHEEP TICK
SHORT-NOSED CATTLE LOUSE
SOUTHERN ARMYWORM
SOUTHERN GREEN STINK BUG
SPITTLEBUG
STRAWBERRY CROWN BORER
STRAWBERRY LEAF ROLLER
STRAWBERRY WEEVIL
STRIPED BLISTER BEETLE
SUCKFLY
SUGAR BEET WEBWORM
SUPERB PLANT BUG
SWEET CLOVER WEEVIL
TARNISHED PLANT BUG
THRIPS
TOBACCO BUDWORM
TOBACCO HORNWORM
TOMATO HORNWORM
TOMATO PINWORM,
TWO-STRIPED GRASSHOPPER
VARIEGATED CUTWORM
VELVETBEAN CATERPILLAR
WESTERN COTTON PLANT BUG
WHITE-LINED SPHINX
WINTER TICK
YELLOW GOAT LOUSE
YELLOW-STRIPED ARMYWORM

WRITE FOR YOUR COPY! This booklet gives detailed information on current federal or state recommendations for the control of an increasing variety of insect pests with toxaphene dusts and sprays.

HERCULES POWDER COMPANY, 970 Market St., Wilmington, Del.

MAKERS OF TECHNICAL TOXAPHENE FOR AGRICULTURAL INSECTICIDES

NX50-91

THE EDITOR COMMENTS

AS 1951 gets under way, the supply picture in basic materials for agricultural chemicals hasn't cleared to any great degree. Trade spokesmen say that the situation is "about the same" as it was a month or so ago, but everyone is keeping an anxious eye on developments in Washington before making any statement for publication.

Shortages of chlorine, benzene and sulfur remain as the most acute in the trade. As the effects of the present emergency become more pronounced, other materials may join the ranks of other critical ones, but it seems to us that the needs of agriculture should certainly not be taken lightly when allocations are made.

The absolute necessity for the use of chemicals in producing adequate foodstuffs and fiber crops has been firmly established not only in practice, but in official testimony before the Food and Drug Administration Hearing of 1950. This fact, plus the accepted knowledge that "food is a weapon" in wartime, should present a strong case for the allocation of adequate raw materials for the pesticide and fertilizer manufacturer. Whether or not this will cut any ice in the unpredictable Washington atmosphere remains to be seen, but it is our guess, as well as our fervent hope, that favorable news may be forthcoming soon.

BURIED in the recently-issued Canadian Department of Agriculture report was a significant statement regarding weed control with 2,4-D. In the three prairie provinces of Canada, over 8 million acres were sprayed or dusted with 2,4-D in 1949, the report says. "The estimated increase in grain yield resulting from the use of this weed killer is from 3 to 5 bushels per acre," it adds. Practically all the common annual weeds which occur in western grain crops, except wild oats, wild buckwheat and tartary buckwheat, are effectively controlled by this inexpensive chemical, it is stated.

That our Canadian neighbors have gone so far toward all-out application of weed control chemicals, is a credit to their foresight and good judgment. An additional yield of from 35 to 40 million bushels of grain on the same acreage, simply by the application of herbicidal chemicals, is a feat of considerable importance.

Probably the report for 1950, to be issued late this year, will tell of even greater benefits from the wise use of herbicides.

WITH persons in the trade, as well as the public, very conscious of possible contamination of dairy products through the use of insecticides on milk cows or in dairy barns, the newly-announced "strip method" of fly control is of particular interest right now. This technique, developed by David Pimentel, Cornell University, has shown promise in initial test work. It consists of spraying strips of screening outside the barn, with a highly concentrated solution of toxicant. Then the strips are hung inside the barns where they control flies for a considerable time. So far, the most effective material has been dieldrin.

Obviously, one of the most important features of this method, aside from the control of flies, is the elimination of any possibility of contaminating milk, milking equipment, feeding troughs or drinking water. Another important feature is the high probability of actually killing all flies which contact the screens, rather than giving them a sub-lethal dose. The less-than-fatal dosages tend to build up resistance in flies, as has been experienced with DDT. It is pointed out that with treated screens, partially paralyzed flies are able to cling to the surface until they get a lethal dose, rather than slipping off with a relatively light shock.

It should be remembered, however, that present results are based on only one season's work in a single area; but just the same, its exceptional success plus the safety feature, gives it more than an even chance for adoption as a standard technique for fly control.

Guest Editorial Written Especially for This Issue of Agricultural Chemicals

Fertilize Pastures ---and Prosper!

by

W. R. Thompson

Associate Professor of Agronomy
Mississippi State College

SEED dealers, fertilizer dealers and equipment people are enthusiastic about the National Grassland Farming Program recently announced by the U. S. Department of Agriculture. Its development means business for them and added income to their farmer customers as well as offering benefit to the entire nation.

Of all the area in the U. S., 62 percent is in grazing land, totaling more than a billion acres. By good planning, including the wise use of fertilizer, correct seeding and other correct management practices, income from pasture can be doubled in the United States, using the livestock now on hand.

With war clouds shadowing the world, manpower in the future will be at a premium in the agricultural field. One man can manage 10 times as much area in grassland as he can in row crops. Food made up from meat and milk and by-products from animals is an important part of our basic food supply. Since food is the most potent weapon for peace, big increases in U. S. prduction are absolutely necessary. Anything that can produce this basic food with less labor and lower cost is an important program today. And the pasture fertilization program offers just such a medium for increased production.

Looking at the pasture program from the standpoint of the fertilizer industry, it is evident that vast amounts of fertilizer material will be needed for this purpose if it is carried out properly. Few people in the U. S. realize that there is need for over a million tons of mixed fertilizer for pasture use alone . . . and this would give only a *minimum* application per acre. Even though some of our range land uses no fertilizer at all, there is other land that can use more than 500 pounds of fertilizer per acre.

Fertilizer material is not food in itself, of course. That is, human beings cannot consume it in the form in which it is sold; but in less than a 12 month period, these plant nutrients can be changed into human food by pasture crops!

The wise use of fertilizer alone will do wonders to our pasture program. If the fertilizer program is left out, then our increased income will be left out likewise. A dollar

(*Turn to Page 91*)

Term "Economic Poison" outmoded, says Rohwer. More comprehensive is the term:

"PESTICIDE"

By S. A. Rohwer

Assistant Chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, D. C.

THE term "economic poison" has been in general use in the United States for a considerable period. It is used in the Federal and several State laws which govern the marketing of products designed to combat various kinds of pests. From my point of view, it is neither a desirable nor satisfactory term and I am glad that it is gradually being replaced. As a term it lacks definiteness and is confusing. It places emphasis on economics and on poisons. It cannot be said that all products are economic, that all the materials used in the products are poisons, nor is it appropriate to imply that all the products are of equal hazard as poisons. As a term it is not suitable for use in all languages.

The word "pesticide" is now being accepted as a more suitable term. While pesticide is not without objection it has more in its favor than any other term or word which has been suggested. It is brief, reasonably accurately understood because of derivation of its component parts, and has the advantage of being easily adapted for use in many languages. In our discussion we will use the word "pesticide" rather than the less satisfactory term "economic poison."

Definition of Pesticides

A PESTICIDE may be defined as a product, substance, or mixture of substances—gaseous, liquid or solid—which may be used to destroy, prevent, control, repel or mitigate any form of plant or animal life, or viruses (except viruses, fungi, bacteria, etc., on or in living man and other animals), and weeds. The common kinds of organisms that are thought of as pests are insects, bacteria, fungi, rusts, smuts, mildews, rodents, other vertebrate animals (other than man) and plants growing where they are not wanted. We usually think of pests as organisms which adversely affect our economy and health but do not live on or in man and other animals and cause disease. The word pesticide thus embraces such terms as insecticides, fungicides, herbicides and rodenticides and their various subdivisions.

A pesticide may be a single chemical substance as sulphur, calcium arsenate or a mixture of substances prepared in form for use. When mixtures are involved the ingredients included to perform the primary function of a pesticide are properly referred to as pesticide chemicals or agents and the other components of the mixture are classed as carriers or adjuvants. The latter category includes such substances as solvents, wetters, emulsifiers, dusts, etc. A mixture of DDT and a carrier such as talc would be a pesticide. DDT is a pesticidal chemical. Most pesticides are mixtures as it is usually necessary to prepare the toxic agent in a form for use.

1 Summary of background and introductory remarks as moderator of *Economic Poisons Symposium* held by the Chemical Engineers' Club of Washington, November 13, 1950, Washington, D. C.

Formulation of Pesticides

IT is important to recognize that pesticides are usually mixtures of substances. The substances used to carry the active principle to desired places are important ingredients. These substances must be compatible, they must not interfere with the toxicity of active agents, nor cause injury to the plant, animal or material on which the mixture is placed, and they must be suitable for use in devices used to apply the pesticide. This is no small order and requires a considerable knowledge of chemistry, physics, and engineering. Added to this, in the making of pesticides, there is need for knowledge of biology for we have to know the responses and habits of the pest and the things it may attack, including its plant and animal hosts. It is also necessary to have information about places where pesticides need to be used, as pests affect agriculture, health, and economy and where they occur in the field, factories, warehouses, homes and all kinds of places frequented or used by man.

Must be Usable

IN addition to technical matters associated with formulating substances to make pesticides, it is essential that the product be usable for the purpose produced. It must be effective in the control of the pest, without harming the plant, animal or product that is injured by the pest. The product protected must be useful after the pest is combatted. The appearance, quality, and flavor

of the product must not be injured and it should not bear objectionable or harmful residues. The pesticide, should be used so it will not destroy beneficial forms of wildlife, including those needed natural enemies that prey on pests, or necessary insects which pollinate important plants. It must not interfere with the the overall productivity of soil. Those who produce, transport and apply pesticides must know how to handle them without injury to themselves and others, their crops and possessions. There are many problems which must be considered in the development and safe use of substances to combat pests.

Laws on Marketing and Use

TO assure that users of pesticides have effective products and appropriate directions for their use there is a Federal law which requires registration in advance of interstate distribution. This is supported by similar laws in some 36 states, and there are also some local ordances. Some states and local laws also govern and control the use and methods of application of pesticides. The transportation and packaging of various kinds of pesticides are controlled by regulations. Food products which bear deleterious and poisonous residues of pesticides are subject to control by Federal and State laws.

Specialized Field

THE wide variety of pests and locations where they occur, and the many kinds of substances required to combat them place the production and use of pesticides high in the category of complicated problems in the industrial field. Production of pesticides challenges igenuity and management and requires skilled technicians and trained employees. Specialized though it is, effective safe pest control is essential. The benefits are great and will expand with development of agriculture and economy. We cannot afford to share our food with pests or tolerate the toll they take on health and comfort. Chemists and chemical engineers have an important place in the important field of pest control.

Insecticides

SPECIALISTS frequently divide the general term insecticides into subdivisions. They have such refined terms as ovicides, larvicides and adulticides to designate the stage of the development of the insect against which the substance is applied. Miticide is another common term to describe a particular class of pests, covered by the term insect, against which the substance is used.

Losses caused by insects.—It has been estimated that insects annually cause losses to man approximating four billion dollars. How firm this estimate is may be subject to debate. It was made, however, before we were accustomed to current costs and familiar with the word trillion. Not all insects are pests. Most of the 80,000 species of insects which occur in America north of Mexico are beneficial. These include the numerous kinds that prey on other insects, those which are useful by aiding in the destruction of unusable plant and animal material, those which pollinate useful plants, and those like the honey bee and a few others which produce useful products, especially honey and wax.

Not all of the 7,500 species of insects which cause important losses each year are combatted by the use of pesticides. Farm practices are used to control the destructive Hessian fly. A predaceous beetle controls the cotton cushion scale, a pest of many trees. Cultured practices, land management such as drainage, and sanitation are all means to reduce losses caused by insects. No matter how intelligently and effectively we carry out all the practices to control destructive insects it is necessary to use pesticides. Without their use it is impossible to combat effectively many of the insects which carry diseases to man, annoy him and affect his health, and the production of necessary food, feed and fiber.

Man increases his problem of insect control.—With the development of commerce and agriculture, man has done much to add to the problem of insect control. Pests such as the Japanese bettle and the malarial-carrying mosquito which invaded Brazil were moved into new areas through commerce. Many of our common pests were of little significance before we developed our agriculture. The Colorado potato beetle lived on wild plants but adopted the potato and moved eastward on cultivated crops. The apple maggot was at home in wild thorn apple but found fruits cultivated by man inviting and abundant. Numerous other cases of this nature have occurred and are continuing to develop. These man-made changes are increasing problems of insect control in the field and in homes.

Benefit from insect control.—The destructiveness of insects to crops had an important bearing on the development of pesticides. The eastward advance of the potato beetle was followed by research and extension which established the value of paris green as an insecticide shortly after 1870. The development of the use of chemicals to control insects has been a rather slow process and even today there are many who look on destructive and noxious insects as things which have to be endured. That insect control pays is, however, being more generally recognized and accepted as a part of good practice. The following illustrations of value of the various classes of pesticides manufactured and the prices paid by farmers for insecticides prove this:

Value of pesticides produced.

1921	$18,100,000
1939	46,900,000
1946	77,600,000

Farmer's cost of insecticides, converted to current price levels.

1934	$28,000,000
1948	60,000,000
1949	69,000,000

The volume of imports of two of the important raw materials used in producing insecticides also illustrate increased recognition of the importance of insect control.

Imports of arsenic.

1919	4,000,000	pounds
1938	38,000,000	pounds
1943	32,000,000	pounds

Imports of pyrethrum flowers.

1919	7,000,000 pounds
1937	20,000,000 pounds
1943	10,900,000 pounds

Increased returns from the effective use of insecticides, however, provide better reasons why farmers and others spend money and effort to control insects. The following selected examples illustrate benefits:

(a) Application of insecticides to the soil to control wireworms, during the 1947 season, in Louisiana increased the per acre yield of sugar cane by 20 tons and the per acre increase of sugar by 3,500 pounds.

(b) The use of DDT insecticides to control tomato fruitworm in California saved the grower and canner one and a half tons of tomatoes in the can, enough for 364 persons for a year.

(c) The use of rotenone-insecticides to control the raspberry fruitworm changed the growing of raspberries in the state of Washington from an unprofitable to a profitable industry. Without control the raspberries were so contaminated as to be unmarketable.

(d) By using 16,000,000 pounds of DDT-sulphur mixture on 375,000 acres in Arizona the yield of cotton lint was increased 145 pounds per acre in 1949. At the prevailing price for lint and seed the value of the harvest increased $9,350,000.

(e) In 1949 alfalfa seed growers in California increased the yield of seed 600 per cent by the use of insecticides. Low production of 275 pounds per acre was increased to average yield of 1128 pounds.

(f) Use of rotenone and DDT insecticides has saved the pea crop for processing in the Northwest from complete failure. In this case the use of insecticides has not resulted in preventing destruction of the peas but has reduced the contamination of green peas by weevil grubs which threatened the processing industry.

(g) In 1947 the application of one gallon of DDT insecticide per acre to 413,000 acres controlled an infestation of tussock moth in Idaho and protected one and a half billion board feet of spruce and fir with a stumpage value of $4,600,000.

(h) Before the development of control for the pepper weevil more than 80 per cent damage was common in many pepper fields in California. It is difficult to find damage by this insect in fields treated with dusts containing DDT. Pepper growers have made a profit of as much as $500,000 in a single year by the proper use of insecticides.

(i) DDT and ethylene dibromide insecticides applied to irrigated lands to control wireworms have prevented damage to such crops as beans, potatoes, onions, lettuce and sugar beets for 2 to 5 years after application. Prior to use of these pesticides large bare spots appeared in many lima bean fields in southern California. Lima bean growers in Ventura county, through the use of soil insecticides, realized additional yield which in one year was worth $7,500,000.

(j) By expending 3 to 5 dollars per acre to treat sweet corn with DDT emulsion, farmers in south Texas increased the per acre value of the crop by $115. Sweet corn without the corn earworm brought a return of $240 per acre while untreated infested corn brought less than $125 per acre.

(k) In 1949 farmers treated 1,000,000 acres with insecticides to control the European corn borer and saved 8 to 12½ bushels of corn per acre. At an average of 10 bushels of corn per acre the yield was increased 10,000,000 bushels. That year the loss caused by the corn borer was estimated at 313,000,000 bushels. The possibility for greater benefits is obvious.

(l) In 1950 insecticides (mostly parathion) were applied by 135 licensed airplanes and 55 licensed ground sprayers to control greenbug on some 654,000 acres in Oklahoma. About 263,000 pounds of technical parathion was used. The cost of treatment was estimated at $1,307,000. The increased yield was 2,615,000 bushels of wheat which at $2 per bushel was worth $5,230,000 with an estimated benefit to the growers of $3,923,000. Even with this it is estimated farmers of Oklahoma lost 21,800,000 bushels of wheat because of the greenbug which at $2 per bushel was worth about $43,000,000

(m) During the last few years through the use of insecticides applied as a part of the general effort to control diseases in our southern states, the incidence of malaria has been greatly reduced. It is said this disease is now being brought under control through the use of effective pesticides.

(n) The use of DDT insecticides to control hornfly in 1948 is estimated to have increased meat and milk production valued at $45 million. In a specific area the weight of a herd of beef cattle increased over the check by 1,500 pounds of meat. In another area where fly control was practiced, milk production increased 20 per cent.

(o) During the 1950 season 68,000,000 pounds of insecticides as dusts and 9,000,000 gallons of insecticides as sprays were used by farmers in Mississippi to treat 75% of the cotton acreage. This during a year when cotton insect pests were unusually abundant. Without the insecticides the crop would have been almost a complete loss.

(p) Without grasshopper control by the application of insecticidal baits to rangelands of Montana and Wyoming in 1949 it is estimated that 11,000,000 pounds of beef would not have been marketed.

Fungicides

THERE are numerous kinds of organisms commonly referred to as fungi, mildews, rusts, smuts, molds and rots which live on or in plants and plant products, affecting growth, development and usefulness. The character and nature of the injury caused is manifested in different ways. The appearance, habits and life cycles of the various groups of diseases are varied and often complex. There are kinds which are seed borne, others that cause rots which persist or develop after harvest, in addition to the wide variety prevalent on and destructive to growing plants. Annual losses caused by these numerous pests have been estimated at four billion dollars.

Various methods and procedures are used to combat these pests. Many kinds are controlled through the use of chemicals. The kind of materials used and methods of application are in many instances generally similar to those used to control insects. Sometimes the fungicides and insecticides can be applied at the same time. The fundamental differences, especially those of size and mobility, between disease organism and insects often have an important bearing on the character of the pesticide that can be used. To protect plants from diseases it may be necessary to cover the surface completely to prevent attack of the minute spore, while less complete coverage will prevent injury from insects which walk or crawl over the surface.

The extent to which fungicides are used to control various plant disease organisms may be illustrated by the amount of three of the better known fungicidal chemicals annually used in their preparation. The estimated annual requirement during World War II for sulphur was 186,000,000 pounds; for copper sulphate pentahydrate 109,000,000 pounds; for zinc sulphate 6,650,000 pounds.

Benefits from use of fungicides.—A few selected examples illustrate benefits from the use of fungicides.

(a) Apple scab is so destructive in an average year in eastern United States that unless it is controlled by fungicides the crop is largely unmarketable.

(*Turn to Page 93*)

Granulation of Fertilizers

by

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THE process by which a material is formed into small grains or masses is termed granulation. As applied to fertilizers, the term granular is commonly used to describe products which have mean particle sizes greater than are customarily associated with such products and which contain relatively small amounts of fine particles. Thus, a fertilizer is classed as granular whether this increase in mean particle size results from the cementing together of individual particles, or from mechanical separation of the smaller particles from the body of the material. Conversely, the terms non-granular and powder fertilizers do not necessarily relate to extremely finely divided materials, but rather to materials which have not been processed in a manner to disturb their normal particle-size distribution.

Consumer demand for granular fertilizer has steadily increased where farmers have had an opportunity to observe its better physical condition in comparison with non-granular materials and mixtures. The improvement in physical condition is reflected by lower caking tendency, less dusting loss, and greater ease with which uniform distribution may be accomplished in the field.

At present there is no generally accepted definition of the particle-size limits between which a fixed proportion of a fertilizer or fertilizer material should fall for it to be classed as granular. Effectively, manufacturing convenience and the attainment of improved physical condition determine the particle-size range of granular fertilizers rather than agronomic considerations relating to the most efficient size of particle for crop production. Granular mixed fertilizers usually pass a No. 5 U. S. series sieve (4 mm. openings) and are retained on a No. 18

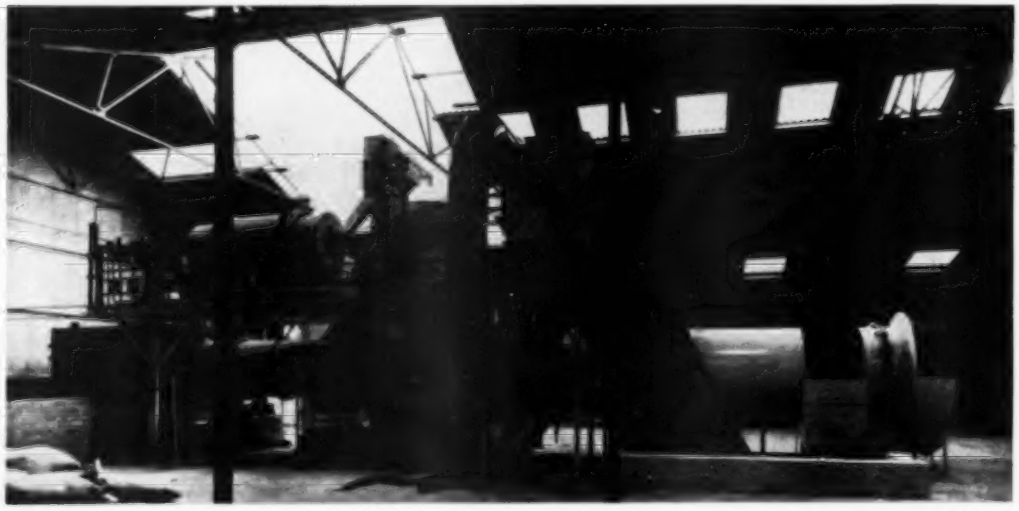
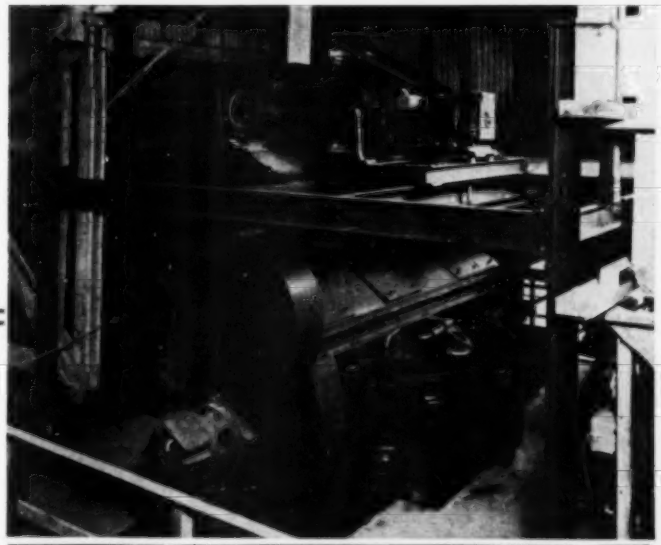


Figure 2. General view of fertilizer granulation plant. (Photo by Sturtevant Engineering Co., Ltd., London.)

1. Paper presented before the Plant Nutrients Division, American Society of Agronomy meeting, Cincinnati, Ohio, October 30 to November 3, 1950.

Two USDA authorities present a study of problems and advancements in the granulation of fertilizer materials.



(Above) Figure 3. Eirich Pan-Type mixer as described in accompanying article.

(Below) Figure 4. Rotary granulator of type described in detail in the article. (Both photos by Sturtevant Engineering Co., Ltd., London.)

sieve (1 mm. openings). Granular forms of individual materials and of some mixtures frequently have a narrower particle-size range and occasionally an appreciable proportion of a so-called granular product passes a No. 18 sieve.

Difficultly-soluble materials such as bone meal and basic slag are recognized to be of greater value when finely ground. Whittaker *et al* *(14)* using non-granular fertilizers in greenhouse tests on Sudan grass, oats, and wheat found that optimum crop response to dicalcium phosphate, heavily ammoniated superphosphate, and basic slag was obtained when these materials were mixed with the soil, whereas localized placement was best for more soluble products, such as superphosphate. The extent, however, to which higher solubility makes granulation agronomically desirable is not known. For the most part, experiments in Canada, England, France, Hawaii, the Netherlands, Scotland, the Soviet Union, and the United States comparing the effect of granular and non-granular superphosphate and other water-soluble phosphates separately or in mixtures have shown no marked differences in crop yields. An important exception is the work of Franck *(3)* in Sweden in which granular superphosphate was found to be decidedly superior to the non-granular form. With continuance of the present trend toward increased production and use of granular fertilizers, further research is needed to provide adequate information concerning the effect of such factors as degree of solubility, method of placement, soil characteristics, crop characteristics and climate in relation to optimum particle size of the various types of fertilizers.

Interest in the development of commercial processes for the granulation of fertilizers was greatly stimulated by the work of Ross and his associates in the United States Department of Agriculture dating from the early 1920's *(4, 5, 10, 11)*. Inasmuch as an adequate discussion of granulation processes applicable to the wide variety of materials presently in use in the fertilizer industry is beyond the scope of a short paper, the present discussion will be limited to certain agglomeration processes which are in use in the United Kingdom *(1, 8, 9, 12, 13)* and in the United States *(2, 7)* for increasing the particle size of superphosphate and mixed fertilizers. Essentially

these processes provide for conversion of finely divided materials and mixtures to a semi-plastic condition by admixture of water, tumbling or cascading the moist material to cause its agglomeration into fine granules, and drying the product.

Probably the greatest commercial development in the granulation of mixed fertilizers to grade has occurred since 1938 in the United Kingdom where mixed fertilizer formulation is much less complex than in the United States. At least two plants employing agglomeration processes were in operation in the United Kingdom prior to World War II, one or more was placed in operation during the war period, and since that time installations have been made at an accelerated rate. Of the more than 1,000,000 tons of mixtures expected to be marketed in the present year, nearly 800,000 tons, or approximately 75 percent will be produced in granular form by agglomeration or slurry dispersion processes. Ammoniation of superphosphate or of fertilizer mixtures as developed in the United States for the use of the most economical forms of nitrogen is not practiced in the United Kingdom owing to the fact that phosphate guarantees are based on water-soluble rather than available P_2O_5. With some exceptions, mixed fertilizer formulation in the United Kingdom is limited to the blending together of ammonium sulfate, superphosphate and potash salts, principally the chloride. In England the number of grades is restricted to four nationally approved mixtures supplemented by a few special-purpose grades, in contrast to the several hundred grades marketed in the United States.

In the United States, The Davison Chemical Corporation for the past 15 years has operated an agglomeration process with rotary drying of the agglomerates to granulate a considerable annual tonnage of superphosphate and some base mixtures *(7)*. The first plant, however, to incorporate ammoniation techniques with granulation directly to grade by an agglomeration process was placed in operation early in 1950 at Des Moines, Iowa by the Iowa Plant Food Manufacturing Company *(2)*. The slurry dispersion process *(9)* has not been developed commercially in the United States.

Granulation of Mixtures

A flow-diagram of the granulation process as applied to non-ammoniated fertilizer mixtures in the United Kingdom accompanies the article as figure 1. The process involves four distinct stages of operation, namely:

1. **Mixing and grinding**
2. **Wetting and agglomerating**
3. **Drying**
4. **Cooling and sizing**

If ammoniation were to be practiced, the second stage would be modified to include addition of ammoniating solutions or anhydrous ammonia prior to the development of the plasticity required for agglomeration.

Figure 2 shows a small granulation plant including rotary granulator, drier, cooler, grading screens and bagging hopper.

Mixing and Grinding

IN this stage the order in which the mixing and grinding operations are conducted is variable. Mixing and grinding contribute to the uniformity with which each material is incorporated in the final granule. Fine grinding aids in preventing formation of oversize nodules and thus decreases the proportion of the mixture which must be processed further. Consequently, the degree of fineness of the initial mixture represents an economic balance between the cost of grinding and the reprocessing of any oversize produced.

In some cases the raw materials are ground separately as finely as practicable before mixing and in others the raw materials are blended together before grinding. In still other cases only that portion of the mixture which is retained on a $\frac{3}{8}$-inch mesh screen is subjected to the grinding operation.

Mixing is accomplished in a rotary batch-type mixer unless mixing, wetting and agglomeration are to be conducted simultaneously in an Eirich pan-type mixer. Multicage Carr-type disintegrators of modified design or Christy-Norris twin-rotor swing-chain pulverizers are used in the grinding operation.

Wetting & Agglomerating

Eirich Mixer: When the Eirich pan-type mixer (Figure 3) is used for agglomeration one-half to one ton batches of material are charged to the pan, a typical pan being 7.5 feet in diameter and 18 inches deep. Rotation of the pan and mixing blades, which are eccentric to the pan, in opposite directions maintains the charge in a constant state of agitation. Under these conditions and depending upon the type of material being treated, the addition of water to an overall moisture content of 12 to 20 percent produces the degree of plasticity required for the formation of agglomerates. Agitation is continued for 2 to 3 minutes to complete agglomeration and compact the agglomerates. The firm, moist, sticky granules formed are discharged through a floor valve to a smoothing hopper and fed at a controlled rate to a drier.

Rotary Granulator: The dry, finely divided mixture is fed at a uniform rate to a slightly inclined rotating cylinder (Figure 4), the first four- or five-foot section of which is equipped with lifting flights for advancing the material. Such granulators vary in size but a typical one, inclined at 2° from the horizontal and rotating at 8 r.m.p., is 6.5 feet in diameter and 18 feet long. The operator, stationed at the discharge end of the granulator, controls the continuous addition of water to the material in the section provided with flights, on the basis of the appearance of the moist granules as they approach the outlet end of the granulator. A build up of "skin" or mud is maintained on the smooth-walled section of the granulator to reduce slippage of the material and promote the rolling and tumbling action necessary for the formation of granules. Externally positioned rapping hammers usually

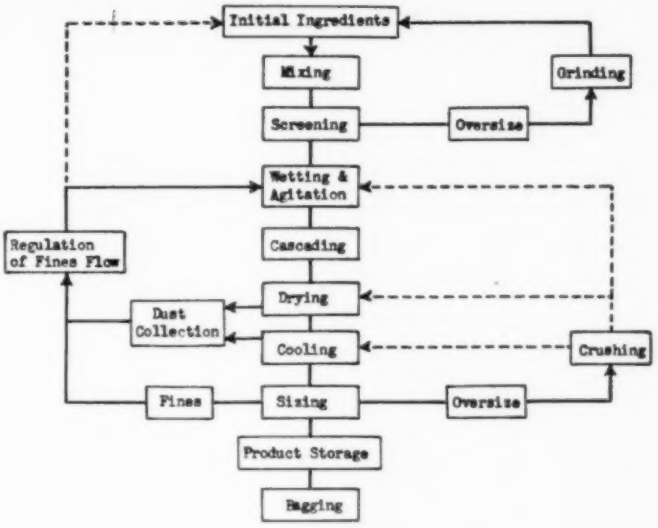
are provided to prevent excessive build-up on the side walls in either the flight or smooth-walled sections. One important advantage of the continuous rotary granulator over the batch-wise Eirich mixer is that a uniform rate of flow of material to the drier is maintained without the use of a smoothing hopper between the agglomeration and drying stages.

Drying

USUALLY, direct-heated single-shell, rotary driers employing co-current flow of the freshly granulated materials and flue gases from coal- or coke-fired furnaces are used to reduce the moisture content of the granules to 3 to 4 percent. This involves evaporation of the major portion of the water added to induce granulation, or 200 to 400 pounds of water per ton of product. Co-current rather than counter-current flow is used to protect the fertilizer from overheating and to maintain it in granular form throughout the drying operation. Co-current flow is particularly effective in this respect because of the case-hardening effect which results from flash evaporation of the surface moisture of the wet granules when they are brought into immediate contact with the flue gases entering the drier at 800°-900°F. The driers which rotate at about 3 r.p.m. vary in size from 3 to 9 feet in diameter and from 30 to 60 feet or more in length, depending upon rated hourly output of finished product (2 to 20 tons) and the amount of water to be evaporated. They are equipped with flights or pentaform assemblies designed to increase gas-soiled contact and thereby drying efficiency, and to reduce to a minimum the breakage of granules and formation of dust during the drying operation. Cyclone-type dust collectors are used to recover the dust carried out of the drier in the gas stream. The exit gases are further cleaned by water scrubbing before being discharged to the stack. Exhaust fans are used to provide an adequate flow of gas through the drier and dust collection systems. The temperature of the gas passing through the cyclones is maintained above its dew point by controlling the temperature of the flue gases entering the drier.

A drier of the roto-louvre type, which combines features of both co-current and countercurrent drying, is used at the Des Moines, Iowa, plant.

Granulation Process for Mixed Fertilisers



Cooling

COUNTERCURRENT cooling with air is employed to bring the hot granules leaving the drier to temperatures (15-20°F. above atmospheric) suitable for sizing, bagging, and storing operations. Most frequently, single-shell rotary coolers approximately 6 feet in diameter and 30-40 feet long provided with lifting flights or assemblies for improving gas-solid contact are used for this purpose, but in some instances roto-louvre and circular, multiple-shelf coolers equipped with rotating arms for moving the material from one shelf to another are employed. Normally, some further drying occurs during the cooling operation, but under certain combinations of circumstances the moisture content of the granules may increase slightly during passage through the cooler. As in the case of the driers, exhaust fans are used to provide the required flow of air through the cooler, dust collector, and scrubbing tower.

Sizing

VIBRATING, oscillating, and rotary types of screens are used for separating fines and oversize from the desired size of granular material. Most of these types of screens are suitable for removing oversize above 4 mm., but none of them is entirely satisfactory for removing minus 1 mm. material because of their tendency to frequent blinding. Various methods devised for reducing the load on the fines screens include the operation of the granulation equipment in such a way as to decrease the amount of fines produced, and the use of air separation to remove an appreciable portion of the fines either during the drying and cooling operations or after cooling and before screening. None of these practices, however, so far has eliminated the need for fine screens, but the difficulties appear to be minimized when not less than 80 percent of the "rejects" are in the form of oversize.

Recycling

IN general, 10 to 20 percent of the material processed is recovered as dust, fines, and oversize which must be further processed. The fines from the screens and the dust from the dust collectors are combined and returned to the system prior to the wetting and agglomerating stages. The oversize is crushed in a bar-cracker mill, in which the material is passed between single-cage bar assemblies rotating toward each other on either side of a fixed bar, or in a Christy-Norris type swing-chain pulverizer. In a few plants all oversize is crushed sufficiently to be returned to the process with the fines and dust while in others the crushed oversize is returned to the drier for further drying, to the cooler, or directly to the sizing operation.

Bagging and Storing

NORMALLY the capacity of bagging facilities sufficiently exceeds the productive capacity of the granulation plant to make it economically impracticable to bag directly from the plant, except as current production may be supplemented by material from bulk storage to insure capacity operation of the bagging equipment. Using this procedure an appreciable proportion, sometimes as much as 25 percent, of the annual production may be and frequently is bagged directly from the cooler during the shipping season.

Bulk storage of granular fertilizers, owing to their free-flowing characteristics, requires the use of solid bulkheads of considerably greater strength than the open-slatted type customarily used to retain non-granular fertilizers. Bag deterioration results largely from the action of acid gases such as hydrochloric, hydrofluoric, and hydrofluorsilicic which are evolved within mixtures containing appreciable amounts of free acid and moisture. In granular materials, the greater space between particles increases the tendency for circulation of these gases to bring them in contact with bag walls and stitching and to hasten bag deterioration.

Granular mixtures usually are bagged in 5-ply paper bags with an inner asphalt-laminated layer for protection against this corrosive action. Other protective measures include ammoniation of the mixture, drying to 2.5 percent moisture, or less, and cooling the product to within 15°F. of atmospheric temperature before bagging.

The occurrence of severe bag-set or caking is much less frequent in granular than in non-granular products. Normal handling of granular material usually satisfactorily disintegrates any set. Caking tends to become more severe, however, as the moisture content of the product, and the proportions of fines and irregularly shaped particles increase.

Slurry Dispersion

THIS process combines rotary drying with the continuous acidulation of phosphate rock, dispersion of the slurry formed, and granulation either of the superphosphate alone, or of the phosphate containing mixed fertilizers. It is used by two plants in England. The acidulation stage may be eliminated if cured superphosphate and water are used to form the slurry.

In this Procter-Ogilvie process, phosphate rock and sulfuric or phosphoric acid are charged continuously to a rotary mixer in which they react and from which they are discharged to a pug mill at a predetermined stage. Water is added and the mixing and kneading action of the blades of the mill serves to increase the fluidity of the freshly prepared superphosphate. The slurry of superphosphate discharging from the pug mill enters the rotary granulator where it meets and is dispersed by streams of freshly mixed salts and of materials being recycled. Additional water is added when necessary to assist granulation. The discharge end of the granulator is restricted so that the increased load and rolling and tumbling action provided in that section assist in shaping and compacting the granules. The granules then are dried, cooled, and sized in the usual manner.

As compared with the process previously described, the granules produced are more rounded and uniform in size. This closer sizing results largely from the necessity for extending the curing period in order to attain the desired degree of conversion of the P_2O_5 to water-soluble form, which is accomplished by returning to the granulator somewhat more than 50 percent of the material leaving the system.

Granulation in the U. S.

AS indicated earlier, mixed fertilizer formulation in the United States generally involves the use of ammoniating solutions containing uncombined ammonia, as well as the use of highly soluble salts, such as ammonium nitrate and urea, not presently involved in mixed-fertilizer manufacture as practiced in the United Kingdom. Consequently, American practice in general gives rise in freshly prepared mxtures to relatively greater liquid-phase volumes per unit volume of water, not only because salts of greater solubility are included in the formula but also because the increase in temperature resulting from ammoniation further increases the relative amount of material in solution (6). Under these conditions agglomeration and granulation may be accomplished at a lower total moisture content but the process requires somewhat more rigid control than when moisture alone is the factor causing agglomeration. One American plant takes advantage of such factors to granulate directly to grade immediately following continuous ammoniation of dry mixtures in a pug mill, whereas another plant neglects the temperature effect and granulates base mixtures by the addition of water to the relatively cool material in the granulator.

The latter plant removes fines by air elutriation but does not include either coolers or scrubbing towers in the process equipment. At this plant, granular grades other than base mixtures are formulated by admixtures of granular individual materials with an appropriate granular base mixture.

(*Turn to Page 95*)

Cotton Insect Conference at Memphis... Group Makes 1951 Recommendations

MORE than 400 person attended the fourth annual Cotton Insect Control Conference held at the Peabody Hotel, Memphis, Tenn., December 7 & 8. The event is sponsored annually by the National Cotton Council of America, in cooperation with farm organizations, land grant colleges, the U. S. Department of Agriculture and the National Agricultural Chemicals Association.

That the use of pesticides will be a major factor in the vastly stepped-up cotton production program for 1951, was reiterated throughout the two-day conference. Speakers pointed out that by increasing the number of pesticide applications from an average of 6 to 8 dustings to 10 to 12, yields were increased by as much as 1½ bales per acre. Economically, this means a net increase of about $23 per acre per application of insecticide, it was stated.

Due to the "buy early" campaign put on by the industry, and the insistence of bankers upon a sound pest control program for 1951, growers were reported to be demanding delivery of pesticides in December and January. The demand was expected to continue into February, even though the materials would not be used until May. Contributing to this unusual demand, of course, is a realization of the tight insecticide supply situation.

The program itself was climaxed by the issuing of tentative recommendations for cotton insect control for 1951 (as printed below), but during the previous time, sessions were held to describe the general cotton situation, cotton production problems, the insecticide supply outlook for 1951, problems in providing adequate finished insecticides, and a summary of cotton insect research highlights for the past year.

Speakers at Thursday morning's session included H. A. Young, president of the National Cotton Council; M. K. Horne, chief economist of the Council; Claude L. Welch, director of the division of production and marketing of the Council; Dr. H. L. Haller, assistant to the chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington; and Ernest Hart, president of the National Agricultural Chemicals Association. Presiding at the opening session was C. R. Sayre, president of the Delta and Pine Land Co.

F. S. Arant, head of the Department of Zoology and Entomology, Alabama Polytechnic Institute, presided at the afternoon session. Speakers included C. M. Beckman, Georgia Agricultural Experiment Station; R. C. Gaines, U.S.D.A., Baton Rouge, La.; H. G. Johnston, Texas A & M College; W. A. Stevenson, U.S.D.A., Phoenix, Ariz.; V. K. Quattlebaum, S. Carolina Agri. Experiment Station; S. L. Calhoun, U.S.D.A.; and Dr. Fred C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington.

Presiding at Friday morning's session was Louis E. Hawkins, director of the Oklahoma Agricultural Experiment Station. On this program appeared L. J. Cappleman, Texas State Director of Farmers Home Administration; W. H. Tharp, Bureau of Plant Industry, U.S.D.A.; L. F. Curl, B.E.P.Q., U.S.D.A.; W. E. Anderson, commissioner, Louisiana Department of Agriculture and Immigration; and C. B. Carney, meteorologist, U. S. Weather Bureau.

Final session of the meeting was under the chairmanship of Joe C. Hardin, president of the Arkansas Farm Bureau Federation. This session consisted of a question and answer period with W. A. Ruffin, Alabama Agri. Extension Service, as moderator. Comments were invited on the 1951 State recommendations before the meeting was adjourned.

Recommendations Made

TENTATIVE recommendations were made by entomologists from 12 states and Puerto Rico, on cotton insect research and control. Some 70 persons took part in the conference, excerpts of which are printed below. It was emphasized that these recommendations are of tentative nature, the final statements being scheduled to appear later with specific localized recommendations. Five major insect pests of cotton were in-

cluded in the report. They are boll weevil, bollworm, aphids, thrips and pink bollworm.

Boll Weevil

The boll weevil, *Anthonomus grandis* Boh., may be effectively controlled with benzene hexachloride, calcium arsenate, toxaphene, aldrin and dieldrin. Benzene hexachloride should be applied at the rate of not less than 0.3 pound of the gamma isomer per acre, calcium arsenate at the rate of 7 to 10 pounds per acre, toxaphene at the rate of 2 to 3 pounds of the technical material per acre, aldrin at the rate of 0.25 to 0.5 pound of the technical material per acre and dieldrin at the rate of 0.15 to 0.4 pound of the technical material per acre. When these insecticides are used for boll weevil control under field conditions, other insect problems have to be considered. Complications involving the cotton aphid, bollworm and spider mites may develop when some of these insecticides are used alone.

Dust formulations approved for use where recommended include the following: (1) benzene hexachloride (3 per cent gamma isomer)—5 per cent DDT mixture; (2) calcium arsenate applied alternately with calcium arsenate—2 per cent nicotine; (3) calcium arsenate applied alternately with benzene hexachloride (3 per cent gamma isomer)—5 per cent DDT; (4) lime-free calcium arsenate —1 per cent parathion; (5) lime-free calcium arsenate—1 per cent parathion plus 5 per cent DDT; (6) 20 per cent toxaphene; (7) 2.5 per cent aldrin; (8) 2.5 per cent aldrin plus 5 per cent DDT; (9) 1.5 and 2.5 per cent dieldrin; and (10) 1.5 and 2.5 per cent dieldrin, plus 5 per cent DDT. Dust mixtures containing 10 per cent of chlordane and 5 per cent of DDT are recommended only in areas where they have given good control. In some areas these mixtures have given erratic results, perhaps due to high temperatures and humidity.

In areas where spider mites are an important factor, dust formulations of organic insecticides should contain sulfur or some other suitable miticide.

Sprays made from emulsion concentrates which have given favorable results and which are approved where recommended are: (1) toxaphene at the rate of 2 to 3 lbs. of the technical material per acre; (2) toxaphene and DDT mixture in the ratio of 2 to 1 with the toxaphene applied at the rate of 2 to 3 pounds of the technical material per acre; (3) gamma isomer of benzene hexachloride and DDT mixture at the rate of 0.3 to 0.5 pound of the gamma isomer and 0.5 pounds or more of the technical DDT per acre; (4) aldrin at the rate of 0.25 to 0.5 pound of the technical material per acre; (5) aldrin and DDT mixture at the rate of 0.25 to 0.5 pound of technical aldrin and 0.5 pound or more of technical DDT per acre; (6) dieldrin at the rate of 0.15 to 0.4 pound of technical material per acre; (7) dieldrin and DDT mixture at the rate of 0.15 to 0.4 pound of technical dieldrin and 0.5 pound or more of technical DDT per acre; and in areas where it has proven satisfactory, chlordane and DDT mixture at the rate of 0.15 to 0.4 pound of technical dieldrin and 0.5 pound or more of technical chlordane and 0.5 pound or more of technical DDT per acre.

Control measures directed against the boll weevil should be applied when definite need is indicated. Except where early season control measures are practiced, insecticides should be applied at intervals of four to five days until the infestation is brought under control. Thereafter, the fields should be inspected weekly and subsequent applications made when necessary.

Bollworms

At least 4 species of lepidopterous larvae cause bollworm damage to cotton. The most important are the bollworm, *Heliothis armigera* (Hbn.) and the tobacco budworm, *Heliothis virescens* (F).

During the past two years the tobacco budworm has been the predominant species early in the season in many collections from cotton, particularly in the eastern part of the Cotton Belt. The yellow-striped armyworm, *Prodenia ornithogalli* Guen. and fall armyworm, *Laphygma frugiperda* (A. & S.) are the others that sometime cause bollworm injury.

Control of this group of insects is often a difficult task and many erratic results have been reported. Factors which contribute to their abundance are sometimes complex and not too well known. The widespread use of certain of the organic insecticides has often resulted in greatly increased bollworm damage, presumably as a result of killing off their natural enemies. Probably, also, changing farming practices resulting from diversification and mechanization have resulted in conditions more favorable for the normal increase of these insects.

Effective bollworm control depends on timeliness of application, thoroughness of application, and the use of properly formulated insecticides. Frequent field inspections during the main fruiting period of cotton in any given field to determine the presence of eggs and young larvae are prerequisite to satisfactory bollworm control. After the larvae have already entered the squares and bolls it is too late for effective control.

DDT is the most effective insecticide known for the control of bollworms. It should be applied at the rate of 1 to 1.5 pounds of the technical material per acre in the form of a 10 per cent dust or as a concentrated spray. DDT may be used in mixtures with other insecticides where other insects as well as bollworm require control. It is compatible with lime-free calcium arsenate but not with regular calcium arsenate. Where one-half pound or more of DDT per acre is applied with other insecticides in regular schedule for boll weevil control, bollworms are usually controlled.

Toxaphene, at from 2 to 3 pounds per acre, is the next most effective insecticide against the bollworm. This may be applied as a 20 per cent dust or as a spray. The dust appears to be more effective than the spray and for this reason the spray is often formulated to contain DDT.

Calcium arsenate and cryolite dusts are less effective.

In areas where spider mites are a problem, dust mixtures containing organic insecticides should include 40 per cent sulfur or other miticide.

Cotton Aphid

Heavy infestations of the cotton aphid, *Aphis gossypii* Glov., often occur on cotton following the use of certain insecticides. Infestation may also be severe on seedling cotton where no insecticides have been applied.

The following insecticides and mixtures which are recommended for general use in cotton insect control will usually prevent an aphid build-up:

1. Benzene hexachloride (3 per cent gamma isomer)—5 per cent DDT mixture in every application at the rate of 10 to 12 even pounds per acre.
2. Benzene hexachloride (3 per cent gamma isomer)—5 per cent DDT at the rate of 10 to 12 pounds per acre in alternate applications with calcium arsenate.
3. Two per cent of nicotine in regular calcium arsenate at the rate of 10 to 12 pounds per acre alternated with calcium arsenate.
4. One per cent of parathion in lime-free calcium arsenate at the rate of 10 pounds per acre.
5. Toxaphene at the rate of 2 to 3 pounds of the technical material per acre in every application (where toxaphene is not formulated with DDT.)

Where heavy infestations of the cotton aphid occur and where the need for a "knock-out" dosage is indicated, the following insecticides or mixtures are effective:

1. Benzene hexachloride applied at the rate of 0.5 pound of the gamma isomer or an equivalent amount of lindane.
2. One per cent parathion dust at the rate of 12 to 15 pounds per acre.
3. Three per cent of nicotine in hydrated lime applied at the rate of 10 to 15 pounds per acre.
4. Another insecticide which will give "knock-out" of cotton aphid but which is not generally recommended because of its extreme toxicity and low residual action is one- half pint of 40 per cent tetraethyl pyrophosphate or its equivalent per acre.

Thrips

Thrips often cause more injury to cotton seedlings than is generally realized, especially in areas where onions and small grains are grown extensively. The destruction of leaf tissue by thrips and the subsequent slow plant growth makes the seedlings more susceptible to injury by

such fungus diseases as the Ascochyta blight and Rizoctonia damping-off. The combined injury may reduce or even destroy stands of young plants. A heavy thrips infestation will retard plant growth and delay crop maturity. Although reductions in yield may not result, the subsequent delay in crop maturity may lower the quality of seed and lint because of the greater likelihood of damage by insects and deterioration associated with unfavorable weather conditions.

A number of insecticides give satisfactory thrips control when properly applied. Toxaphene at a rate of one-half to one pound per acre, in either dust or spray form, gives effective control. A spray mixture consisting of two-thirds of a pound of toxaphene and one-third of a pound of DDT per acre, or a dust mixture containing 5 per cent of DDT and benzene hexachloride (1 per cent gamma isomer) applied at the rate of 12 to 15 pounds per acre, is also effective.

Aldrin applied to young seedlings as a spray or dust at a rate of eight hundredths to one-eighth pound per acre gives good thrips control. Dieldrin applied at a rate of five hundredths to one-tenth pound per acre is very effective.

Other insecticides which give satisfactory control either as a spray or dust at indicated rates per acre are: chlordane, one-half to one pound; benzene hexachloride, one-tenth to fifteen hundredths pound; heptachlor, one-fourth to one-half pound; and DDT, one-fourth to one-half pound. DDT has not given satisfactory control at temperatures above 90 degrees F.

Although some of the phosphate compounds are effective against thrips, they are highly toxic to warm-blooded animals.

Pink Bollworm

Methods of controlling the pink bollworm, *Pectinophera gossypiella* (Saund.), include destruction of cotton stalks immediately following the harvest, heat treatment of cottonseed, burning of gin waste, compression of lint, and the application of dust and spray formulations. In South Texas pink bollworm infestations early in any season are in proportion to the number of these insects which survive the period between crops. The longer this period the fewer insects will survive; therefore, the number of overwintering insects may be reduced by destroying cotton stalks at the earliest possible date. The best procedure is to first cut the stalks with a stalk cutter which crushes them to the ground. If the operation is carried out sufficiently early a high mortality of pink bollworms and other cotton insects results from exposure to heat of the sun. The roots should be plowed out promptly and the crop debris plowed under. All seedlings or sprouted cotton plants developing after the plowing should be eliminated before fruiting so as to create a long host-free period between crops. For best results cultural practices should be carried out on an area-wide basis and the cooperation of every cotton grower is needed. It is a matter of record that cultural practices used to control the pink bollworm will also control the boll weevil.

Cotton growers of the Lower Rio Grande Valley of Texas have used the cultural control as outlined above and, over a five year period, lint production averaged 342 pounds per acre. Over a five year period prior to the beginning of this method of control by early stalk destruction lint production averaged 213 pounds per acre. This rate of increase in yield at current prices amounted to around $17,000,000 for the 1950 crop involving about 375,000 acres. It is recognized that the increased production resulted largely from boll weevil control and greater productivity of the soil because of improved farming methods.

There is a progressive build-up in the pink bollworm population as the season advances; therefore, every effort should be made to expedite fruiting and setting the crop. The following practices are recommended for hastening the maturity of the cotton and thereby reducing the pink bollworm infestation: heat or chemical treatment of planting seed; early uniform planting of quick maturing varieties; control of the cotton fleahopper, thrips, aphids, and other insects that delay fruiting; clean cultivation; elimination of late irrigation; and chemical defoliation.

In cold, arid regions, such as the West Texas Area, where the harvest must be completed after frost, as many bolls as possible should be removed by snapping, mechanical harvesting, or by heavy pasturing. The cotton stalks should be left standing during the winter months, since the highest mortality of hibernating pink bollworm larvae in such areas is obtained in the bolls on standing stalks. Where the stalks are plowed under early in the winter the fields shoud be winter irrigated wherever possible as this practice will also reduce pink bollworm survival.

Larvae of the pink bollworm enter mature cotton seeds to feed and to hibernate. To prevent overwintering or spread of the insect, cottonseed are given a heat treatment as a continuous process of ginning in much of the pink bollworm quarantined area. In the remainder of the area, cottonseed are heat treated upon arrival at designated oil mills or other treating plants. In the heavily infested areas a second heat treatment is required before movement into other quarantined or free areas. In all pink bollworm quarantined areas gin waste is destroyed promptly by burning, or heat treated for use as fertilizer, and all lint is compressed before it is moved into areas that are free of pink bollworm.

DDT continues to be the best insecticide for control of the pink bollworm. It can be applied as a dust or as a spray in an emulsion. From 1½ to 2 pounds of technical DDT should be used per acre application. Dust formulations containing 10% DDT should be applied at the rate of 15 pounds per acre. Large scale demonstration tests with application beginning when the cotton is in the 6 to 8 leaf stage have proven highly effective when followed with later applications as required by infestation conditions of pink bolloworms and other insects. Those early applications are especially beneficial in shortening the fruiting period with resultant fewer generations of pink bollworms making early stalk destruction possible. This reduces the number of hibernating pink bollworms.

Aphids and spider mites may develop when DDT is used alone for pink bollworm control. Benzene hexachloride and sulfur or parathion may be added to the dust formulations and TEPP may be added to the spray formulations for control of these pests as recommended.

Regardless of the other insects to be controlled, all formulations for control of the pink bollworm should contain sufficient DDT to give the minimum of 1½ lbs. technical DDT per application per acre irrespective of the other materials or spacing of applications.

Wide choice of insecticides offered to cotton growers in 1951 recommendations. Because of possible shortages, this fact regarded as of particular importance. All precautions urged when using pesticides, to guard against hazards to user, to livestock, beneficial insects and plants.

North Central Weed Conference at Milwaukee hears reports of increased crop yields through

Use of Herbicides

THE seventh annual meeting of the North Central Weed Control Conference, at Milwaukee, Wis., Dec. 12 to 14, was a striking demonstration of the increasing interest in chemical weed control. Despite severe winter weather conditions, attendance exceeded 700, but observers noted that of most significance was the fact that the audience at Thursday's final session was as large as the one attending the opening session on Tuesday.

On the program were 101 speakers who covered every phase of weed control in the fields of research, education, industry relations and regulatory matters. Sessions were held in Milwaukee's municipal auditorium, where, also, some forty manufacturers of weed control equipment and supplies displayed their products.

At the board of directors meeting Dec. 11, officers for 1951 were elected, as follows: President, Dr. D. W. Sylwester, extension botanist, extension div., Iowa State College, Ames, Ia.; vice-president, Dr. Keith P. Buchholtz, Dept. of Agronomy, Univ. of Wis., Madison, Wis.; secretary-treasurer, Dr. O. C. Lee, Dept. of Botany and Plant Pathology, Purdue Univ., Lafayette, Ind.

New chairmen of the four principal committees are: Research, Dr. A. L. Bakke, Botany and Plant Pathology, Iowa State College, Ames, Ia.; Extension, J. R. Fleetwood, Dept. of Agronomy, Extension Service, Univ. of Missouri, Columbia, Mo.; Industry, Earl D. Anderson, secretary ,National Sprayer & Duster Association, Chicago, and Regulatory, T. F. Yost, Noxious Weed div., State Board of Agriculture, Topeka, Kan.

Some idea of the immensity of the weed control problem in the 2,500-mile-wide conference area was suggested in figures cited by H. E. Wood, of the Manitoba Dept. of Agriculture, Winnipeg, Canada. In the fourteen states and three Canadian provinces comprising this conference, he said, 178,000,000 acres are devoted to raising the principal grain crops, with uncounted other millions of acres for specialized crops, orchards, pastures, hay fields, fallow lands, etc., in all of which perennial weeds flourish.

Another startling suggestion of the difficulty of the control problem came from Dr. F. W. Went, Kerckhoff Laboratories of Biology, California Inst. of Technology, Pasadena. In general, he said, weed seeds remain viable in the soil under field conditions for periods of ten years, even though soil is moist and temperatures are favorable to germination. After twenty to thirty years, he said, a considerable percentage of the buried seed is still viable.

"Dozens of years of continuous weed removable are necessary," said Dr. Went, "to exhaust the soil from its natural complement of weed seeds. Almost every field which has been cultivated has a weed seed supply sufficient for a dozen years or more."

From G. R. Fraser of the Saskatchewan Dept. of Agriculture, however, came a note of optimistic encouragement. In the three Canadian provinces of Alberta, Manitoba and Saskatchewan, he said, a half million acres of crop land were treated with 2,4-D for weed control in 1947, whereas, three years later, in 1950, the acreage covered with 2,4-D was some 13,566,000. This achievement was considered typical of the interest farmers everywhere are taking in chemical weed control.

Industry Problems

UNDER the chairmanship of R. L. Brandenburger, of Ralston Purina Co., St. Louis, Mo., the industry section of the Conference met Thursday afternoon for consideration of problems affecting manufacturers and suppliers of chemicals and equipment for weed control.

Discussing "Seller Responsibility," J. A. Noone, of the National Agricultural Chemicals Association, Washington, D. C., said the manufacturer "is assumed to be an expert and to have expert knowledge about his product. He should take reasonable measures to advise the public of the information necessary for proper results and to avoid damage which he as an expert, can prescribe."

Seated, (left to right): R. L. Brandenburger, Ralston Purina Co., St. Louis, 1950 chairman of Industry section; O. C. Lee, Purdue Univ., secretary-treasurer of North Central Weed Control Conference.

Standing, (left to right): Dr. Keith Barrows, Dow Chemical Co., Midland, Mich.; Dr. W. W. Worzella, So. Dakota Exp. Station, Brookings, 1950 president, NCWWC; Gordon Brandes, Rohm & Haas Co., Philadelphia; Ed Rappe, Swift & Co., Chicago; R. R. Wangerin, Monsanto Chemical Co., St. Louis; J. Glatthaar, Monsanto Chemical Co., St. Louis; J. A. Noone, secretary, Nat. Agricultural Chemicals Association, Washington.

The manufacturer, he emphasized, has the responsibility of assuring that his directions are proper and adequate for the recommended application, with due consideration of all factors involved. He recommended "forthright statements prominently displayed on the label, as required by federal statutes."

The retailer, Mr. Noone continued, should be well informed about the product he is selling and should not recommend it for uses other than those recommended by the manufacturer. He should encourage users to read and follow instructions and warnings on the label, always remembering that "the satisfied customer is the best customer and he is the one who uses the product properly and gets the desired results." The user, Mr. Noone went on, is responsible for applying the product exactly as recommended and with strict observance of precautionary procedures as stated on label.

On pending federal legislation affecting the agricultural chemical industry Mr. Noone urged manufacturers to let their Congressional representatives know the industry's attitude and also contact their respective state legislators where adverse laws are involved.

"In our opinion," he said, "education, not legislation, is the answer to practically all problems that have arisen in the use of pest control chemicals. The labor-saving, money-saving, day-to-day, unpublicized benefits from pest control chemicals far outweigh the mishaps that make newspaper headlines. Rather than deny these benefits to broad segments of agriculture by legislation, efforts should be made to educate the comparatively few individuals who do not use the materials properly."

Wm. Dickison of the H. D. Hudson Co., Chicago, stated that manufacturers are seeking ways and means to offset corrosive effects of the newer chemicals on sprayer equipment. They've been working on this probem for years, he said, but it is only within recent years that the new chemicals have been of serious concern. He regarded as unsatisfactory the proposal that manufacturers could use informative labels on how to prevent hazards and breakdowns of equipment. A logical approach, he said, would be development of knowledge of how chemicals affect sprayer metals before they are offered for sale. This, he said, would minimize a problem of the near future, when shortage of materials and curtailment of production will affect the available supply of equipment.

His suggestion of a cooperative research program, the conference was later informed, had already been launched one week prior to the Milwaukee gathering. Manufacturers of equipment and chemicals and other interested parties, it was announced, have agreed with government authorities on a joint project to study the corrosion problem.

Dr. Dale E. Wolf of the DuPont Semesan Laboratory, Wilmington, Dela., in discussing "Herbicidal Formualtions," stressed the teamwork of all concerned in producing effective, uniform and economic compounds. Products evolved, however, vary as the number of products and the people who make them. He expressed the hope that there will be "great improvement in the future."

Opening a panel discussion on "Working Together — Industry and State," Dr. W. W. Worzella, of So. Dakota Experiment Station Brookings, S. D., and 1950 president of the North Central Weed Control Conference, said that coordination of all interested groups in weed control may never reach perfection, but that "in the few years we have been working together the public has definitely benefitted."

O. C. Lee, Purdue Univ., secretary-treasurer of the Conference, commented on the mutual interest of both industry and educational institutions in creating public interest in weed control. He suggested closer coordination of recommendations and wider use of the extension service in getting the information to the farmer.

H. C. Kohler, Monsanto Chemical Co., St. Louis, Mo., in a paper read in his absence by J. Glatthaar, also of Monsanto, observed that most government departments seem to welcome contact with industry. Government penetration into industry, he declared, should be reduced to an absolute minimum. Government should avoid regulations interfering needlessly with private industry; it should abstain from marketing activities; it should avoid granting preferred status to some at the expense of others; it should consult industry on proposed regulations; and "an adequate profit should be conceded." Industry, must provide effective and wise cooperation with government.

C. D. Leither, of Meyers & Bros. Co., Ashland, O., and president of the National Sprayer & Duster Association, in discussing how research workers and machinery designers might cooperate better, asked if researchers could not outline their developments to manufacturers, through the NS & DA, a year in advance of their general release. "We desire to work with you," said Mr. Leither, "if you give us the time necessary to apply your developments. Unnecessary and specialized types and sizes of equipment could be avoided by coordination, with resulting reduction in production costs, higher quality equipment and more satisfactory performance."

Earl D. Anderson, secretary of the Nat. Sprayer & Duster Association, Chicago, as mentioned earlier was selected as 1951 chairman of the Conference Industry section. To fill the newly created post of vice chairman, Dr. Keith C. Barrons, of Dow Chemical Co., Midland, Mich, was named.

In an outstanding paper on "Screening of New Herbicides," W. C. Dutton of Dow Chemical Co., reviewed 37 new chemicals which have been under investigation by the Conference Research Committee. Major part of the screening, he said, is done by the chemical companies in their own laboratories and few people realize how small a proportion of the compounds screened show any indication of merit.

Reviewing the 37 chemicals he said several of the herbicides "Did not perform in 1950 in a manner that will encourage field workers to carry on further work with them." A second rather large group of relatively new materials, he continued, have given results that make it seem worth while to further explore their possibilities.

In a third group he placed a few materials which have been under trial for several years and have given indications that they can be useful for some weed control problems. Most of these, he added, seem to be most useful on horticultural crops.

Judgment of the first group as "no good," he emphasized, may not be final and each field worker should use his own judgment as to further study of them. In the third group of approved compounds, he said, all have some one or more uses, but may not be safe for everything.

Panel Appears

IN a panel examination of "Use of Chemicals on Railway Rights of Way, Power and Telephone Lines," Homer L. Jacobs, of Davey Tree Expert Co., Kent, O., asserted that "Chemical brush control in the utility field is here to stay and will grow." Chemicals, he said, eliminate costly hand cutting and make lines readily accessible for repair and rebuilding after storms, etc.

Right-of-way maintenance men can get along with available chemicals, he said, but would like to find a chemical that will kill in one application; is less selective, less susceptible to drift; and non-corrosive to equipment. He offered these suggestions as a challenge to research workers. Other speakers told of progress in chemical control of weeds on railroad rights of way.

New information on chemical control of adequate weeds and pond scum on farm ponds and hatcheries was presented by E. W. Surber, formerly with the U. S. Fish & Wild Life Service, now with the Public Health Service in Chicago. The problem, he pointed out is complicated as it involves how to kill the weeds but not kill the fish. 2,4-D, he stated, showed more promise on submerged plants than on algae. Where hydrodictyon, or "water net," predominated, sodium arsenite appeared more effective than copper sulfate, but on the basis of cost, copper sulfate is the least expensive. He also discussed control of cattails, bulrushes, water lilies and willows.

Discussing "Indirect Effects of Herbicides," Dr. C. J. Willard, Dept. of Agronomy, Ohio State Univ., Columbus, O., said that due to drift, it is inevitable that plants may be unintentionally killed. Weed control operators should, however, "make it their business" to study the problem and find ways to overcome it.

There will always be unreasonable complaints, he said, about killing of wild flowers where roadsides are sprayed. He advised operators to listen to these complaints, but "if the weight of evidence is on the side of weed control, go ahead with it."

He warned that TCA and the dinitro compounds offer serious hazards, to be thoughtfully considered. He knew of no reports of livestock being poisoned by the DN's. Reports of individuals being allergic to or affected by 2,4-D are "probably true," he went on, but, he added, "I know of more people being poisoned by eating eggs than affected by 2,4-D."

Referring to the fact that cattle will eat ordinarily poisonous plants, like Canada thistle, jimsonweed, sunflower, etc., after spraying, he explained that their palatibility is attributed to the increased sugar content of the plant caused by the 2,4-D. This increases from 24 to 72 hours after spraying. If there are any

poisonous plants in a pasture, he suggested that cattle be kept out from three to four days following the spraying. Pigweed and other common weeds, he said, accumulate high amounts of potassium nitrate after treatment with 2,4-D and this is a hazard "which we should look after."

"There will probably be many more problems, real or imaginary as chemical weed control develops," said Dr. Willard.

In discussions of regulatory phases of weed control, Manitoba's methods created considerable interest. Shortly after the province was created in 1870, said Henry Wood of the Manitoba Weed Commisson, Winnipeg, a noxious weed act was passed, that gets full farmer cooperation.

Under the act a levy of $1 per acre can be made against any offending farmer. He must be advised on necessary steps he must take to rid his land of weeds, and if he does this the $1 levy is cancelled.

An amendment to this act gives the weeds commission power to take over and operate a weed infested farm and in the past ten years thirty properities of 4,000 acres have come under this section. Elimination of weeds has increased land values and the farms serve as demonstrations of what should and can be done, he said. Farmers are also required to keep their half of roadsides free of weeds. If they don't, the weeds are cut and costs charged on tax bills.

"Regulatory measures," said Mr. Wood, "must command the respect and support of the farmers. If they fully understand the objectives, they will become cooperative."

In this country only a few states look at the weed problem in a serious and sound manner, asserted T. F. Yost, of the Kansas State Board of Agriculture, Topeka. "Is control of weeds less important than control of insect pests?" he asked. "What is accomplished by letting the weeds have their own way? We started in Kansas in 1937 when there were 200,000 acres covered with bindweed. South Dakota got into action with 400,000 acres of bindweed to start on. Why jeopardize future generations with a burden of unwanted weeds? Weed control is one of the best means to demonstrate patriotism and loyalty to our country."

In sessions devoted to educational programs experiences were reported by various speakers on their use of radio, newspaper stories, extension bulletins, farm tours, field demonstrations, traveling exhibits and other media. R. L. Brandenburger, of Ralston Purina Co., also told how industry reaches the farmer in much the same way as the educators through advertising, direct mail, store displays, booklets, circulars, etc.

Both industry and the extension service, said Mr. Brandenburger, have the common goal of serving the farmer to the best of their ability. "To the extent to which we succeed in selling the farmer on our ideas," He said, "both the farmer and our industry will prosper. We must train him so he knows how to use our products properly to get maximum results."

Industry and educators, he continued, can do a better job if each knows and understands what the other is doing. "Let's keep each other posted," he said, "so that we can both get the right product to the right place at the right time."

He complimented the extension people on the uniformity of their recommendations. These he said, need to be simple; if they are, it means simplicity of products and that may be of great importance in the period of shortages ahead. He urged the extension services to hold meetings early, so that farmers will learn what to do where materials shortages exist, such as, at present, is true with chlorine, benzol and phenol. Extension people, he also suggested could help industry by presenting weed control to farmers in terms of increased production, rather than operation costs.

Glimpses of the encouraging work under way to assist the farmer in his war on weeds were offered by many speakers. Improvements in aerial spraying operations were outlined by Eldon H. Sorensen of the Sevdy-Sorensen Co., Worthington, Minn. and others. A. R. Ayers, Univ. of Illinois, told of improvements in spraying rigs which spell increased efficiency in weed control while studies under way to develop better pumps, bearings, nozzles, etc., were reported by R. E. Larson of the U.S.D.A. Bureau of Plant Industry, Soils and Agricultural Engineering. Droplet size investigations were reported by Chas. E. Fisher of the U.S.D.A. and also by G. L. Shanks, Univ. of Manitoba, Winnipeg.

Dr. E. P. Sylwester, Iowa, newly-elected president of the Conference, told how greater use of chemicals can be made by showing farmers how to utilize dormant sprays against woody plants during winter months when other farm work is slack and how dormant spraying can lengthen the season for commercial operators. O. M. Berge, Univ. of Wisconsin, outlined how farmers can be persuaded to look on sprayers as essential pieces of farm equipment, with multiple uses.

There were also reports on control of perennial weeds, horticultural weeds, range weeds and brush, along with other reports on relation of chemicals to plant physiology and weed control by cultural and cropping methods. The annual dinner was held in the Schroeder Hotel's Crystal Ballroom, at which Canada's Minister of Agriculture, the Rt. Hon. J. A. Gardiner, presented an address on "Our Common Heritage."

Oklahoma City, Okla., was selected as site of next year's meeting on Dec. 11, 12 and 13, 1951. A decision was reached to launch an official quarterly publication, to be called "Weeds," when financial details are arranged. Official standing was given the year-old Industry section, by constitutional amendment providing representation for this section on the Board. Because of disturbed world conditions, the Board voted adversely on proposals for holding a national meeting of the four regional weed control conferences. Instead, the NCWCC will hold its regional meeting in Oklahoma City in December, 1951, as planned.

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National Joint Committee Stresses Importance of Correct Fertilizer Application

by

H. H. Slawson

ENGINEERING aspects of fertilizer application were emphasized at a meeting in Chicago, Dec. 18, sponsored by the power and machinery division of the American Society of Agricultural Engineers and the National Joint Committee on Fertilizer Application. Membership in the latter includes representatives of the National Fertilizer Association, American Society of Agronomy, American Horticultural Society, the Farm Equipment Institute and the A. S. A. E.

The keynote of the day's discussions at the Stevens Hotel was voiced by Dr. Frank W. Parker, USDA, in his address at the opening of the conference. He pointed out that, since plant nutrient deficiencies in soils are so widespread, provision must be made for correcting such.

"This is the primary purpose for use of chemical fertilizers," he said. "They afford relatively simple means of bringing one or all soil nutrients to the optimum level for crop production."

He expressed surprise that the importance of fertilizers and organic materials in soil management should be questioned in some quarters, including Congress. That seems strange, he said, considering that U. S. fertilizer consumption is approaching 20,000,000 tons annually. Soil management, he continued, has two objectives: (1) the efficient production of crops of good quality; and (2) improvement or maintenance of soil productivity.

"Fertilizers have little or no direct effect on soil structure," he stated. "When crop yields are restricted, due to poor soil moisture and air relationships, the returns from fertilizer will be very disappointing. Fertilizers can, however, make important contributions to improving soil structure. . . . Good fertilizer, by increasing crop yields, often doubles or trebles the amount of organic matter returned to the soil in the form of crop residues and farm manure."

Contrary to popular belief, Mr. Parker said, virgin soils are not always fertile. A high percentage of our soils, he asserted, are naturally deficient in one or more nutrients required for good crop production. Some soils are quite acid and deficient in calcium and readily available potash, or are seriously deficient in one or more minor elements.

"Organic nutrients grown on the land," he went on, "cannot increase the total amount of any mineral nutrient. They may alter the availability of some but such changes are of relatively small magnitude.

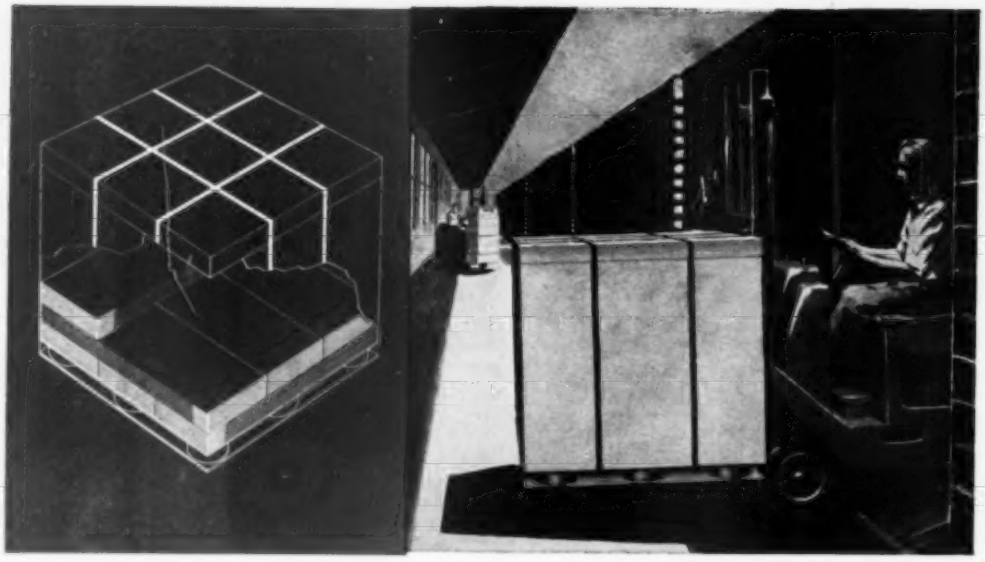
"The value of organic materials for correcting nutrient deficiencies depends in large measure on their composition. The importance of adding organic matter to soil is recognized universally as a good and desirable practice. Use of one or more of a long list of fertilizer chemicals is also a good and desirable practice on many soils. The fertilizer and soil amendments frequently make possible production of greater crops which, in turn, assures return to the soil of more organic matter of improved quality."

Pictures of available fertilizer placement equipment were projected on the screen from the film library being assembled in the USDA from manufacturers. The pictures were presented by Glenn A. Cumings. Of all farm equipment, he said, fertilizer distribution machinery is the most diversified on the market. Equipment ranges from small hand devices to airplanes. The machines are for all types of fertilizer and for application under widely varied conditions throughout the country.

Emphasizing the importance of fertilizer placement, he cited experiences in Washington state where crop values were increased from $19 to $1,000 per acre, just by placing the fertilizer in different positions in the soil. The information available, he declared, should be used more widely.

Reporting on work of a subcommittee on machines developed for experimental work, Orval C. French of Cornell University, Ithaca, N. Y., announced that a directory has been compiled and will soon be made available, listing such equipment for studying the relation of placement to fertilizer efficiency. There has been much duplication of effort in designing experimental machines, he said, because the prior existence of available designs was not known.

"The results of fertilizer placement efficiency studies," said Mr. French, "may often be in error because of inaccuracy in the placement equipment. Thus it is exceedingly important that effective and reliable equipment be used. It seems likely that results from various sections of the country might be more nearly comparable, if the same or similar placement equipment were used."



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Twenty-five years ago, when the National Joint Committee was organized, one of its first projects dealt with fertilizer placement for corn. That problem still continues, said R. M. Merrill of Deere & Co., Moline, Ill., vice chairman of the Joint Committee, in introducing Dr. George D. Scarseth, director of research of the American Farm Research Association. Proper placement of starter fertilizer, declared Dr. Scarseth, is the key to increasing corn yields. However, he claimed, it is not always placed properly by conventional corn planters.

"On hard ground," he said, "the fertilizer is not placed deep enough and may retard early growth, if rain fails to wet the ground soon after planting. The fast speed of tractor-drawn planters tends to pull the planter out of the ground, so the fertilizer is placed too shallow."

Row fertilizer, he stated, should be placed from two to six inches deeper than the seed. Side placement in a band, about two inches on either side or on one side of the seed, he added, is good when the fertilizer is placed two to six inches deeper than the seed. He warned that the fertilizer must not be placed in contact with the seed. Farmers, he asserted, would use more fertilizer if it were placed deeper, because they would get better results.

Shallow placement, Dr. Scarseth went on, develops early roots in soils that will be dry much of the growing season, so fertilizer will be less effective. He told of finding corn starving for phosphate in August, although as much as 120 lbs. per acre had been drilled in the row at from two to three inches deep. Yield here was 56 bushels per acre. But where the phosphate was placed eight inches deep in the furrow, the plants showed adequate phosphate by tissue tests and yielded 67 bushels per acre.

Although research has shown the advantage of plow-furrow applications, no satisfactory equipment has yet been found by farmers who complain about extra time required to refill small hoppers. "If a manufacturer could solve that problem," he declared, "a lot of progress in better fertilization would result."

Ideal Applicator Described

Describing his "dream" machine, Dr. Scarseth said it would have three hoppers, one each for nitrogen, phosphate and potash, and by working levers the farmer from his seat on the tractor could drop extra plant food where needed in addition to the row application.

"As he crosses his variable fields," he said, "the farmer, as he passes over light spots or eroded hilltops, could open the levers for extra nitrogen and phosphate. And when he crosses low places, rich in nitrogen and phosphate, but low in potash, he could close the hoppers on the unneeded elements and open the potash lever." When farmers get soil tests revealing the different nutrient requirements in various sections of a field, such a machine will be in demand, he said.

Although but few farmers would think of growing corn without fertilizer, yet not many fertilize their pastures, remarked Dr. D. R. Dodd of Ohio State University, in discussing methods of fertilizer application to pastures. There is ample evidence, he said, that fertilizer is important in improving grasslands, but differences in climate, soil and other factors account for variations in opinion on how to do it and there is need for more research, he declared. "But the important thing is that we get more fertilizer on our pastures."

C. H. Mahoney, director of raw products research for the National Canners Association, Washington, D. C., told the gathering that growers of canning crops are keenly interested in using fertilizer placement techniques developed by researchers but can't do it because suitable equipment is lacking.

Such equipment is unavailable for green peas, he claimed, while for sweet corn the machinery picture is "rather pathetic." For snap beans, important fertilizer placement machinery is under development and for tomatoes, he said, application machinery could be developed with modifications for the varied conditions under which the crop is grown. All this, he pointed, indicates a strong demand and excellent markets in which manufacturers should be interested.

J. D. Barnard of Minnesota Valley Canning Co. also dwelt on the lack of suitable placement equipment. He told how his company had to design its own machines for deep placement of fertilizers on canning crops to obtain unvarying yields.

Liquid Fertilizer Use Expanding

Sketching the origin and expansion in use of liquid fertilizers, Procter W. Gull of Spencer Chemical Co., Kansas City, Mo., said that in 1947, 200,000 acres of farm crop lands were treated with anhydrous ammonia, while in 1950 that figure had increased to slightly more than one million acres.

Weighing advantages and limitations of liquid fertilizer, he pointed out that (1) it is a satisfactory source of nitrogen; (2) application equipment is available; (3) it has a price advantage only if large amounts are used; (4) it needs large storage facilities; (5) storage, transportation and application equipment are suitable only for its use; (6) it loses its economy when other nutrients are required.

Because of cost factors, he predicted that increased use of liquid fertilizer will probably come about through application on a custom basis, a system which makes application possible almost as cheaply as for ammonium nitrate. Where custom service is developed, liquid fertilizer will probably have considerable local promotion, he said, and this will result in great sales pressure on other sources of nitrogen.

Discussing "Airplane Application of Fertilizer," Malcolm H. McVickar of the National Fertilizer Association pointed out that the plane should be used only where broadcasting of the fertilizer is recommended. Ideal areas, he said, include pastures, small grain fields, rice fields, cranberry bogs and on strip mine areas.

(*Turn to Page 97*)

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AAEE elects Roy E. Campbell; discusses toxicological problems of INSECTICIDES

IN a joint convention with the Entomological Society of America, the American Association of Economic Entomologists met at the Cosmopolitan Hotel, Denver, Colo. for a four-day session beginning December 18. The A.A.E.E. named as president for 1951, Dr. Roy E. Campbell, U.S.D.A., Alhambra, Calif., to succeed Dr. C. P. Clausen, U.S.D.A., Washington, D. C. First vice-president for 1951 is Dr. Charles E. Palm, head of the department of entomology, Cornell University, Ithaca, N. Y., and a member of the editorial advisory board of *Agricultural Chemicals*. Dr. Palm succeeds Dr. Campbell in this position. Secretary-treasurer is Ernest N. Cory, College Park, Md., who was re-elected.

Plans for the consolidation of the A.A.E.E. and the E.S.A. were discussed in the business session, but formal approval for the merger must await a poll of the membership of each group. This was expected to be had early in 1951.

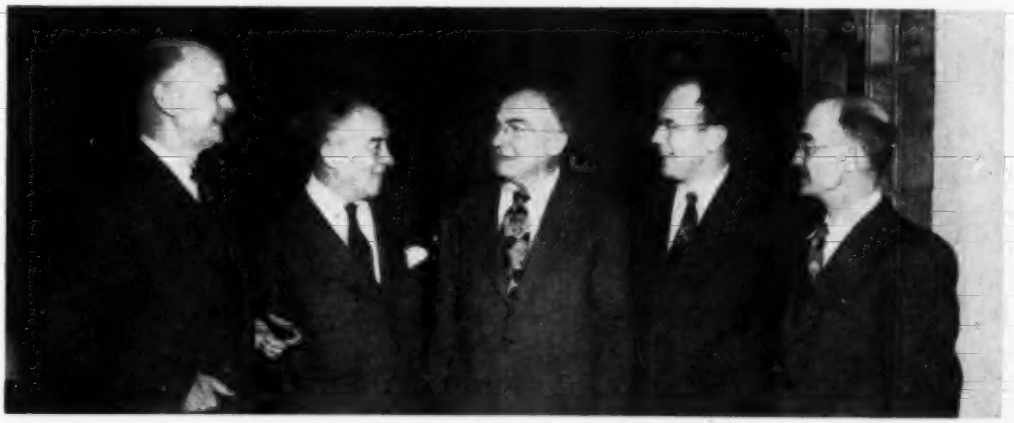
Titles of papers presented at the meeting covered many phases of insect pest control, insecticides involved, toxicity studies, and methods of bioassaying. Five new insecticidal compound's were introduced by representatives of four manufacturers at the meeting.

A discussion of changing problems and procedures in grasshopper and Mormon cricket control was presented by Claude Wakeland, U.S.D.A., Denver, Colo. He said that infestations can be controlled at their source and flights prevented when State, local and Federal cooperation is adequate. Control practices have been altered by the advent of BHC, chlordane and toxaphene applied either as sprays or dusts, and new application methods, including air coverage, have also changed the picture. Airplane baiting or spraying is feasible for controlling extensive infestations on range or idle lands, he declared.

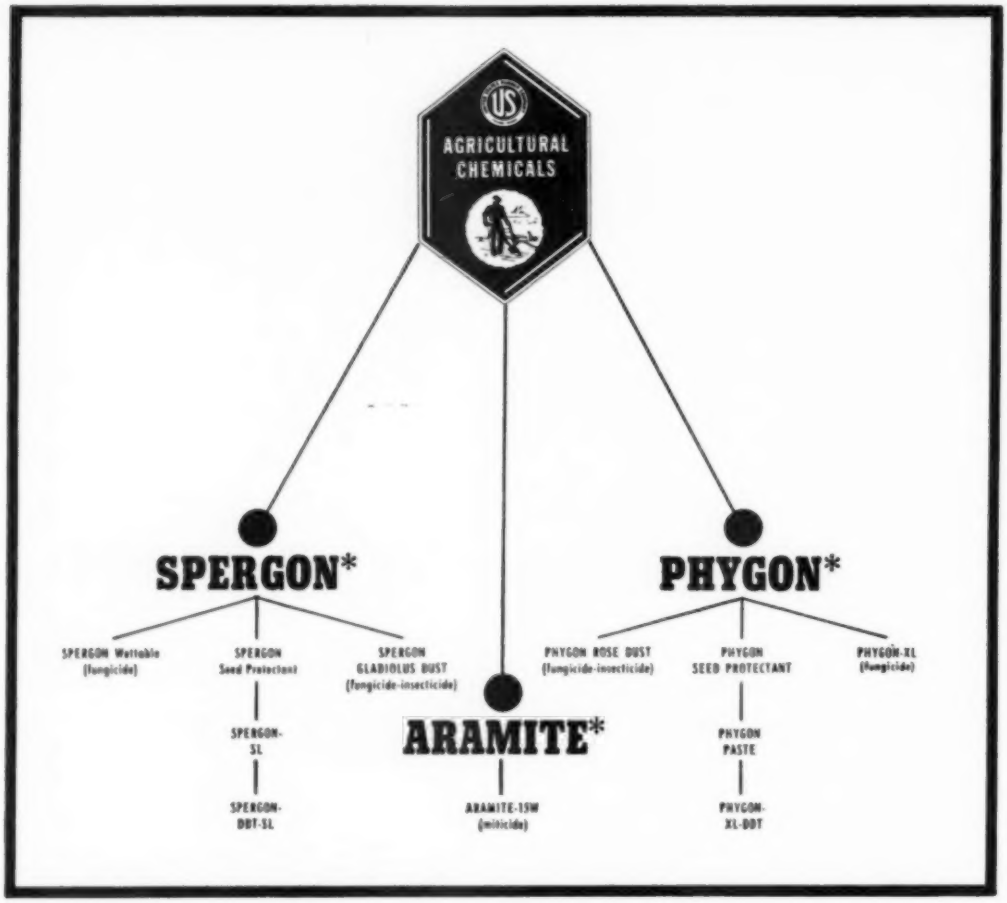
A paper by J. A. Munro and R. L. Post, N. Dakota Agricultural College, Fargo, told about provisions made by the agricultural experiment station in that state for a continuing emergency insect control project to provide necessary emphasis on emergency problems in insect control as they arise. The paper pointed out that the newer insecticides have probably not been evaluated fully as control materials, because the rather sudden occurence of infestations following possibly years of freedom from such, causes an emergency when such an outbreak occurs.

Capt. Joseph W. Jones, U. S. Air Force, discussed problems encountered in the use of aircraft for insecticide dispersal. He told of experiments in which Air Force planes were used to cover as many as 3,900 acres in a single flight for control of flies and mosquitoes. He reported the application of .278 lb. of DDT per acre, at a cost of approximately 25¢ per acre. Using a C-47, it was possible to carry a heavy load of insecticidal material which is sprayed from a height of about 100 feet.

Dr. F. C. Bishopp, Assistant Chief, Bureau of Entomology and Plant Quarantine, presented an in-



Below: Officers of AAEE and ESA at Denver. Left to right: Dr. C. P. Clausen, U.S.D.A., Washington, D. C., outgoing AAEE president; Dr. E. N. Cory, College Park, Md., re-elected AAEE secretary-treasurer; Roy E. Campbell, Alhambra, Calif., newly-elected AAEE president; Dr. H. H. Ross, ESA secretary, and W. P. Haydes, ESA president.



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formal discussion of some insecticide problems. He pointed out that shortages of certain basic materials for insecticide manufacture, including chlorine, benzene, and alcohol would probably interfere with full production of a number of newer insecticides and that the sulfur shortage might make it necessary to use that material in insecticide combinations only where actually required. He emphasized the importance of buying early, using insecticides only where needed, and in minimum amounts required. Intelligent use, he said, depends upon a knowledge of the insect pests to be controlled. Reference was made to the importance of having equipment for applying insecticides in good condition and that shortage of metals might interfere with normal production of various types of applicators.

Dr. Bishopp stressed the importance of maintaining the confidence of the public by recommending effective insect control procedures—with emphasis on safety. He urged users, especially entomologists, to avoid injury to persons, animals, crops, and soils through the intelligent use of insecticides.

He laid special emphasis on the importance of keeping the discovery and development of insecticides unhampered through unnecessary restrictive legislation. The investigation of the question of food contamination by the Delaney Committee of the House of Representatives was mentioned by Dr. Bishopp and the hope was expressed that all available facts regarding the use of pesticides would be presented to the Committee before any recommendation is made for material changes in existing legislation.

New Products

NEW chemical compounds for insecticidal purposes were introduced at the meeting. Four manufacturers were represented. S. B. Penick & Co., New York, introduced a new synergist for use with pyrethrum, allethrin, rotenone and ryania. The product, to be marketed under the trade name of "Sulfox-Cide", is N-octylsulfoxide of isosafrole.

Geary Chemical Co., New York, offered two new systemic insecticides, for experimental use only, "Systox" and "Potasan". The first, is trialkylthiophosphate; and the other, diethyoxythiophosphoric acid ester of 7-hydroxy-4-methyl coumarin.

"Compound 4049" was introduced by American Cyanamid Co., New York. In preliminary tests, it was reported to have effect on aphids, mites, Mexican bean beetle, plum curculio and others, and at the same time exhibited a wide margin of safety to warm blooded animals. The product's formula is S-(1,2-dicarbethoxyethyl) 0,0-dimethyl-dithiophosphate.

Commercial Solvents Corp., New York, introduced the product "Dilan," a combination of two nitroparaffines: 2-nitro-1, 1-bis (p-chlorophenyl) propane and 2-nitro-1, 1-bis (p-chlorophenyl) butane. The material has shown specificity in preliminary tests, against Mexican bean beetle, potato leaf hopper and other bean insects. Its toxicity is reported to be "much less than DDT."

Hearing Discussed

"THE Residue Tolerance Hearing —Before and After," was discussed by Bernard D. Levinson, presiding officer of the recently completed Food and Drug Administration Hearing. In his prepared paper, he complimented the entomologists for their "important role" in contributing to the record. "When the regulations are issued," he said, "the sections dealing with necessity for use of insecticides will be based almost entirely upon the testimony and exhibits of these witnesses." The speaker told about the process through which the voluminous testimony must go, stating that the ultimate decisions fall into two categories; first, what chemicals are necessary on what crops; and second, what should be the tolerances for residues.

The physical task of reading and cataloging the data is great, he said, pointing out that it would require an estimated full work year just to read the record.

The first step, he said, is to find out what substances are effective in controlling pests on various crops. The filing of briefs is expected to simplify the work of the Agency in making recommendations. (The deadline for such filing was December 15.)

In determining whether the necessity for use has been shown, considerable weight will be given to official recommendations of state and federal agencies, he said. Many witnesses from these agencies testified that they do not make official recommendations until a substance has been tried experimentally for 2, 3 or 4 years, and such witnesses are generally free from partiality.

On the other hand, the situation with other materials is entirely different, he pointed out. Some of these are still in the experimental stage, and even the companies which make them are not prepared to recommend their use. "Between these two extremes, the testimony relating to necessity for use varies as much as the chemicals themselves," Mr. Levinson observed. "There will probably be a number of instances where the evidence as to necessity for use is close to the borderline. In such cases, a very careful study of the record will be made to find out, among other things, the extent to which the substance has been used; the other substances available to do the same job, the extent to which the chemical is used on other crops, its toxicity to humans and its effect on the psysiology of the plant."

But the most vital matter of setting tolerances lies in the toxicity of substances found to be necessary to the production of fruits and vegetables. Problems faced in setting such tolerances, he explained, include interpreting animal feeding studies in terms of effects on human beings; translating milligrams per day which can be tolerated, into parts per million of food; determining the adequacy of safety factors which are

(*Turn to Page* 83)

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A Visit With Some of Europe's Plant Disease and FUNGICIDE EXPERTS

by Muriel J. O'Brien

Editor's note: Miss O'Brien's European trip included visits with so many prominent agricultural scientists in England and the Continent, that we persuaded her to write a brief travelog of the six week's journey. Although much of the history and events concerning botanical travel in Europe appear in other more detailed reports, this sketch consists of comments on a more personal level. Traveling in an unofficial capacity, the authoress was able to visit and move about with more freedom than might be possible otherwise. A plant pathologist, she is with the U. S. Department of Agriculture, at Beltsville, Md.

OUR airplane itinerary enroute to the Seventh International Botanical Congress, which we were to attend in an unofficial capacity, took us through Newfoundland, Shannon, London, Copenhagen and finally to Stockholm. The entire field of botany was covered at these sessions, as reported previously, including, of course, the session on the biology and control of weeds, stressing control with growth regulating substances.

The visiting scientists received royal attention, with the Royal House of Sweden and the Swedish scientists acting as hosts to the gathering. His Royal Highness, the Crown Prince, now King Gustav VI opened the Congress, then held a reception later at the Palace to honor the assemblage. The Swedish scientists arranged side trips to view ancient and modern places of learning and the beautiful scenery of the country. We visited research institutions at Uppsala and the homes of Linné in the town (Uppsala) and

(*Turn to Page* 87)

In the Photos:

(Upper): Helena L. G. de Bruyn, noted for her work on genus Phytophthora, taken near Stockholm.

(Next to top): Dr. Johanna C. Westerdyck, mycologist and head of "Willie Commelin Scholten" laboratory, Baarn, Holland.

(Third photo): Dr. S. P. Wiltshire, director, and Miss Grace Waterhouse, research worker, Commonwealth Mycological Institute, Kew, England.

(Fourth photo): Dr. Philip Gregory, noted for work on spore dispersion, and J. M. Hirst, assistant, at Rothamsted Experiment Station, Harpenden, Herts., England.

Bottom row, (left): Dr. C. E. Foister, head of plant pathology section; and Miss Mary Noble, authority on seedborne parasites, at Department of Agriculture for Scotland, Corstorphine, near Edinburgh, Scotland.

Center: The "Willie Commelin Scholten" Phytopathological Laboratory, Baarn, Holland.

Right: Group of mycologists and pathologists pictured on visit to Swedish Plant Protection Institute, Stockholm.

Left to right: Drs. F. C. Deighton, British mycologist of West Africa; Karl Silberschmidt, Brazilian mycologist; A. J. P. Oort, pathologist of Wageningen, Holland, and A. Ciccarone, pathologist, Rome, Italy.

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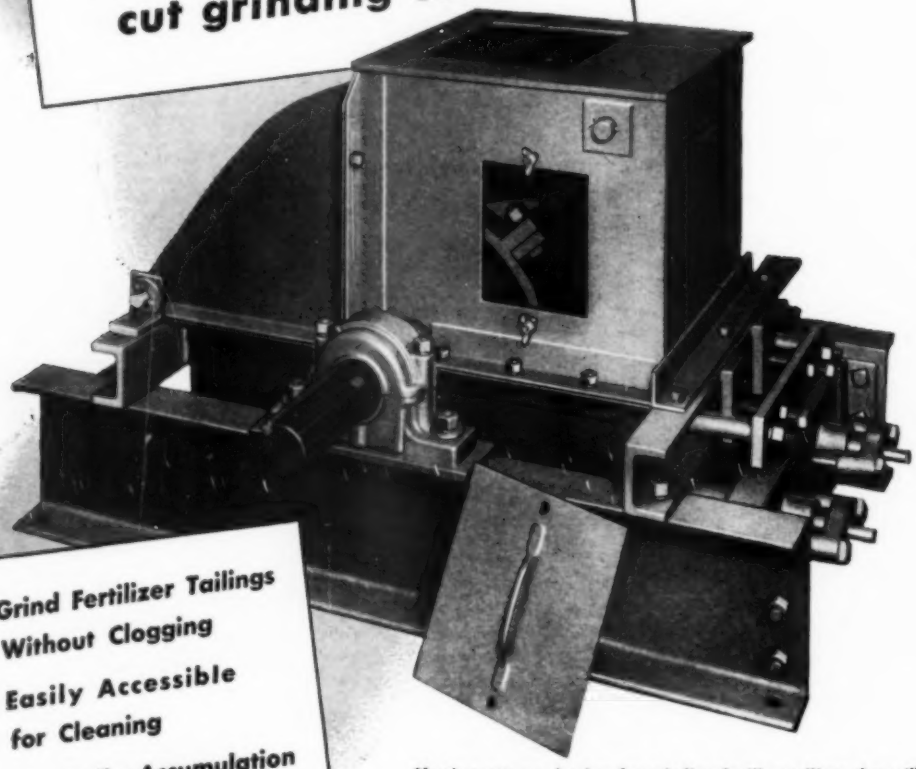

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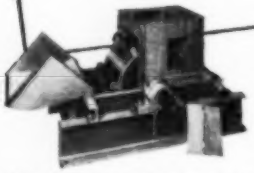

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Testimony before Delaney Committee Establishes

FERTILIZER NECESSITY

DECLARING that "it is neither economically feasible nor physically possible to rely upon organic manures exclusively in our present day agriculture," Dr. Richard Bradfield, head of the department of agronomy, Cornell University, Ithaca, New York, told the Delaney Committee in Washington that our entire civilization would have to be revamped if use of such a system were to be attempted.

Testifying before the Select Congressional Committee in December, Dr. Bradfield pointed out and answered the arguments presented by organic farming advocates. To the charge that chemical fertilizers are not "natural," he conceded that a highly purified chemical is not a natural product in the same sense that animal manure is. "But," he continued, "even though the farmer uses organic manures, these manures are decomposed by the soil by microorganisms and release the minerals needed by the crop in forms which are identical with the forms supplied in chemical fertilizers in practically all cases. If the form of the element actually taken up by the crop is identical in the case of both organic and chemical fertilizers, how can we expect any different effect from the materials once they have reached the interior of the crop and are utilized by it in its growth process?"

Another organic argument, he went on, is that chemical fertilizers are made with corrosive acids which poison the soil. The example most frequently cited is super-phosphate, which is made by treating rock phosphate with sulfuric acid. The reaction which takes place between the sulfuric acid and the rock phosphate forms the neutral salt, calcium sulfate or gypsum—and gypsum is no more corrosive than table salt.

To refute the argument that "crops grown with chemical fertilizer are more attractive and nutritious to insects and plant pathogens," he cited historical facts which reveal that insect pests have wrought damage to the crops of the world since biblical times. "We know that some of the most serious outbreaks of disease in historical times occurred before chemical fertilizers were used extensively," he said. The great potato blight in Ireland late in the 19th century and the destruction of French vineyards in the same period were further citations. As a modern-day clincher, he challenged any remaining doubters to visit vegetable and fruit markets in rural districts of any under-developed country which has not yet used commercial fertilizer, and compare the amount of disease on the products displayed there with that found on products for sale in U.S. markets.

Another argument is that crops grown with commercial fertilizers are less nutritious to man than those grown with organic fertilizers. This argument has a strong appeal, he noted, and pointed out that efforts have been made to organize clubs in which the members agree not to purchase vegetables grown by fertilizers other than organic. He cited the wealth of evidence to disprove such claims, and concluded that so far as science has been able to determine, this argument regarding nutrition is just as unsupported by reliable evidence as the other claims.

Of all the claims against chemical fertilizers, the one regarding the impairment of human health has alarmed more people than any of the others, Dr. Bradfield declared. He reviewed the manner in which one specific story was developed and presented by the organic advocates. An article by the late Dr. J. K. Wilson of Cornell was printed posthumously in the *Journal of the American Society of Agronomy*, Dr. Bradfield said. The article reported that many of the fresh vegetables found on the open market of Ithaca, N.Y., and several of the canned baby foods for sale in grocery stores contained surprisingly large quantities of nitrates. Dr. Wilson had pointed out that cases of blue babies had been reported in certain sections of the west as being associated with a high content of nitrate in the drinking water, and suggested that vegetables very high in nitrate might also cause disturbances. "He had no evidence that such was the case," Dr. Bradfield emphasized, "but merely pointed out the possibility of such being the case and the advisability of investigating the matter further." (A check with physicians in the Ithaca community indicated that there is no record in the community nor in any other place in New York of any diseased condition of children which could be attributed to the nitrate content of the vegetables which they eat.)

Dr. Bradfield then related sub-

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sequent events leading up to an article in "*Organic Gardening*" in which charges were made that commercial fertilizer is a cause of human disease. The editor of the organic publication had written Cornell University for more information about Dr. Wilson's findings, and Dr. Bradfield was delegated to reply to the editor. "It was apparent . . . that the editor was reading into the article ideas of his own which were completely foreign to those of Dr. Wilson," Dr. Bradfield stated. "For that reason, I replied to the letter in considerable detail, pointing out that Dr. Wilson had no information as to how the crops which he analyzed had been fertilized, and that crops which had never received any chemical fertilizer frequently contained concentrations of nitrates far in excess of those reported by Dr. Wilson. From calculations based on Dr. Wilson's data, I pointed out that the amount of nitrogen in an acre of cabbage yielding at the rate of 10 tons per acre would amount to only 7.5 pounds, the amount of nitrogen in 1.5 tons of ordinary farming manure.[5] I had hoped that my comments would . . . bring the article in line with the evidence in Dr. Wilson's paper, but unfortunately it had no such effect."

Dr. Bradfield added that not only did the article appear in the magazine, but that a subsequent advertising circular alluded to it as follows: "—Now comes evidence given by a great scientist connected with Cornell University, that a commercial fertilizer is responsible for bringing about human disease." Copies of this circular were mailed far and wide, Dr. Bradfield reported, and because of the reference to Cornell, scores of letters from many parts of the world came in requesting more information. "I cite this experience to show the way one prominent leader of the organic school has given his readers an entirely false impression of the work of a competent but unfortunately deceased scientific worker who was not in position to defend his views."

John R. Taylor, Jr., acting manager, American Plant Food Council, Inc., Washington, also testified, emphasizing that the fertilizer industry is interested only in having the true facts honestly presented. The industry, he reiterated, cooperates sincerely with the U. S. Department of Agriculture and the state agricultural experiment stations, and depends largely on these agricultural research agencies to develop recommendations as to kinds and quantities of fertilizers, time and method of application, and many other fertilizer practices that play important roles in determining crop yield and crop quality.

Longevity Affected?

OFFERING strong evidence that there is a direct correlation between fertilizer consumption and life expectancy in various countries of the world, Dr. Ralph W. Cummings, director of research, North Carolina Agricultural Experiment Station, Raleigh, testified to the effect that in India, where the life expectancy of males at birth is only 26.9 years, fertilizer consumption per capita is but .07 kilograms of nitrogen and .006 kilograms of phosphoric acid. At the top of the list, by comparison, are the Netherlands, and Denmark, with life expectancies of 65.7 and 63.5, respectively. These countries are the heaviest consumers of both nitrogen and phosphoric acid, as follows: nitrogen, 10.4 and 12.7; phosphoric acid, 11.5 and 15.9, respectively.

Dr. Cummings emphasized that regardless of whether the soil is fertilized with organic or inorganic fertilizers, the elements used by plants and absorbed by their roots are taken up in the same forms. "Organic materials applied to the soil undergo microbial decomposition which reduces the essental elements to simple forms which the plant roots can absorb. Chemical fertilizers supply these same simple forms directly and most of the experimental work shows that it is possible to supply the balanced needs of the crops more precisely, more completely, more economically, and more efficiently by the wise use of chemical fertilizers supplementing good soil management practices than is possible by the indirect organic route. Also, I think it should be obvious to anyone who gives serious thought to the matter that the supply of organic materials which could be made available for fertilization purposes would supply only a small fraction of the plant food needs now being met by chemical fertilizers.

"In my opinion, there is no justification for believing that human health has been adversely affected by the use of chemical fertilizers. On the contrary, the evidence is overwhelming that a raising of nutritional standards has been made possible by their use."

In summarizing, Dr. Cummings said that synthetic fertilizers are a valuable and entirely indispensable part of our economy. "To abandon their use in the more advanced countries of the world would be to close an open door to nutritional progress. To withhold their introduction in the less developed countries of the world is to subject many areas to continued starvation."

Adding an authoritative voice to the testimony presented before the Select Committee, Dr. Emil Truog, professor of soils and chairman of the Department of Soils at the University of Wisconsin, Madison, spoke regarding the effect of applying chemical fertilizers to soils on the condition of these soils and quantity and nutritive value of crops produced on such soils. "Absolutely no authentic evidence exists to the effect that the application of chemical fertilizers to soils in accordance with approved practices . . . causes injury to these soils with respect to their physical, chemical or biological condition," he said. "In fact, when used in accordance with these recommended practices, an improvement of these conditions usually follows."

As to the quantity and quality of vegetation growing from such

(Turn to Page 89)

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The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

F. S. Beecher and S. P. Doolittle of the U.S. Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland, report that during August, 1950, a small test was made to determine the relative efficiency of certain fungicides in the control of downy mildew of cucumbers, caused by the fungus *Pseudoperonospora cubensis*. Downy mildew appeared too late in the season to permit any definite conclusions as to the degree of control of this disease by the various materials used, but interesting data were obtained on the control of angular leaf spot, a bacterial disease caused by *Pseudomonas lachrymans*.

The fungicides used were tribasic copper sulfate (3-100), ziram (2-100), and zineb (2-100). They were applied as sprays to plots consisting of 2 rows of 11 hills each. The plots were randomized and replicated three times. The sprays were applied with a small power sprayer using a single hand nozzle. Applications were made at 7-day intervals, beginning July 31 and continuing through August 28.

Angular leaf spot had appeared by July 10 and was well distributed over all the plots on August 1. After the first applications of the sprays on July 31 the disease continued to spread in the check plots and in those sprayed with ziram and zineb, but in the plots treated with tribasic copper sulfate there was little further infection with angular leaf spot. On August 28 the plants in the check plots showed severe and general injury of the younger foliage by angular leaf spot, and the new growth of plants sprayed with ziram and zineb also was badly damaged by the disease. Where tribasic copper sulfate was applied there was almost no spotting of those leaves produced after August 1 and there seemed to be no copper injury to the foliage. Downy mildew and another fungus disease, anthracnose caused by *Colletotrichum lagenarium*, appeared about August 25, and by September 11 plants in the check plots were dying from the combined effects of these diseases. The plants sprayed with the organic fungicides were in poor condition but those treated with tribasic copper sulfate still were producing some fruit though considerably damaged by downy mildew and some anthracnose infection.

These workers conclude that this experiment showed a marked superiority in the control of angular leaf spot by tribasic copper sulfate

Table 1.

Effect of soil fumigation and soil drench treatments with fungicides on incidence of lettuce downy mildew in the seed bed.

Seed bed treatment[a]				Disease Index (means of 3 replicates)		
Soil fumigation		Soil drench				
Material	Rate	Material	Rate/sq. yd.	Asgrow Great Lakes (Iceberg)	Asgrow Dark Green Cos (Romains)	Average of both varieties
Methyl bromide	4 lbs./100 sq. ft.	Fermate 2-100	½ gal.	2.61	9.13	5.87
do	do	—	—	47.70	73.57	60.64
Chloropicrin	3cc./sq. ft.	Fermate 2-100	½ gal.	4.23	3.68	3.95
do	do	—	—	65.80	78.04	71.92
do[b]	do	—	—	51.48	66.71	59.09
—	—	Fermate 2-100	½ gal.	2.45	5.21	3.83
—	—	Tersan 2-100	do	6.00	4.91	5.45
—	—	Dithane Z-78 2-100	do	0.00	0.00	0.00
—	—	None	—	38.05	53.43	45.74
			Average	24.26	32.74	

[a] Notes relative to soil fumigation and soil drench treatments: Methyl bromide confined with Kraft paper and applied 11/8/49. Chloropicrin confined with water seal and applied 11/10/49. The second application of chloropicrin, in the one instance indicated, 11/12/49. Prior to injecting chloropicrin the second time the soil was carefully spaded thus replacing the surface layer with that from the subsurface zone having received near maximum fumigation from the first application. Approximate soil temperature during fumigation 63° F. First drench treatment applied 11/28/49 and continued at weekly intervals to 1/9/50.

[b] Two applications, an interval of 2 days between first and second application.

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as compared with ziram or zineb. The organic fungicides did not give adequate control; but after the first application of the copper fungicide there was a surprisingly abrupt check in the spread of angular leaf spot.

Controls of Chlorosis

ACCORDING to R. H. Sciaroni and G. A. Zentmyer of the University of California, chlorosis or yellow has been known for a number of years in commercial heather (*Erica*) grown in the field for cut flowers in San Mateo County, California. Affected plants show chlorosis, stunting, lack of new growth, and, in extreme cases, severe dieback. Chlorosis is also a problem on alluvial overwash soils containing varying amounts of granite. In general, these soils are very low in fertility. Their pH ranges from 5.5 to 6.4, which would indicate that the chlorosis is not of the lime-induced type.

Growers had reported that soil applications of ferrous sulfate and sulfur had not given satisfactory control of the chlorosis. In July, 1949, initial experiments were conducted, using soil applications of ferrous sulfate on *Erica regerminans* and *E. hyemalis* var. Felix Faure. A solution of ferrous sulfate (commercial grade, 90% ferrous sulfate) containing one ounce per gallon of water was applied in basins around the plant at the rate of one gallon of solution per plant. After about six weeks there was indication of slight response, but greening was not pronounced in this treatment. In September, 1949, a series of spray applications was begun on *E regerminans*, using 0.25%, 0.5% and 1% ferrous sulfate solutions in replicated blocks. No wetting agent or safener was added. The plants were sprayed to run-off; sprays were applied with a 3-gallon knapsack sprayer.

A definite response to the spray was noted in 15 to 20 days; the plants resumed growth and the normal green color was restored. The degree of greening was proportional to the concentration of the iron applied. In the untreated block the plants remained chlorotic and stunted. Because of this favorable response, the grower in whose planting the trial was made sprayed the remaining one and a-half acres of *E. regerminans* in the fall of 1949, using a power sprayer and 175 to 200 pounds pressure. Another grower with chlorotic *E. hyemalis* var. Felix Faure sprayed his field with 1% ferrous sulfate just prior to cutting and obtained excellent foliage for the cut crop.

The blooms are cut from the varieties *E. regerminans* and *E. hyemalis* var. Felix Faure in November and December, and plants begin new growth in March and April. In April, 1950, five growers started spraying fields of chlorotic *E. regerminans*, *E. melanthera*, and *E. hyemalis* var. Felix Faure on a five-week schedule using 1% ferrous sulfate solution. About 30 acres are involved in these applications. To date the plants have regained and maintained their green color and are growing normally.

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Cotton Entomologists Discuss 1951 Problems

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

STATE and Federal workers interested in cotton insect research and control met at the Gayoso Hotel, Memphis, Tennessee, December 4-6 to review the results of the past season's work and to formulate a guiding statement for cotton insect control recommendations in 1951. (See page 39, this issue). The conferees included research and extension entomologists and associated technical workers from Alabama, Arkansas, Georgia, Illinois, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, the United States Department of Agriculture, and the National Cotton Council of America.

The status of the more important cotton pests in the various areas during 1950 was reviewed briefly. The educational and extension programs carried on to aid the cotton growers in each state were discussed by the extension workers. The results of experiments and field tests carried on with various insecticides and combinations of materials used during the past season for cotton insect control under the conditions existing in the respective states were summarized and discussed by the research workers.

It was readily apparent that one or more of the important insect pests of cotton were a serious problem during the year in all cotton growing areas represented at the conference. For example, in North Carolina, South Carolina, and Georgia the boll weevil population was reported as greater than during any previous year on record. This insect is usually not a serious pest in Tennessee, but in 1950, the weevils appeared in practically all areas of the state in which cotton is grown. For the second consecutive year, weevils caused extensive damage to cotton in Alabama, and in Texas they were more abundant in the Lower Rio Grande Valley than during any year since 1945. The bollworm and related species were of somewhat more concern than usual in North Carolina, South Carolina and Georgia, and in Tennessee, these pests were generally distributed and caused serious injury to cotton in some counties. Thrips were a problem in a number

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of areas, including South Carolina, Georgia, Tennessee, and Texas. The cotton leafworm made its appearance earlier than in any recent year and required control measures in a number of states, especially Texas, Oklahoma, Arkansas and Missouri.

There seemed to be general agreement among the conferees that South Carolina led the field with regard to having undertaken a well planned, carefully organized, coordinated and far-reaching educational and extension program for the benefit of its cotton growers during 1950. This program followed closely the national 7-step cotton production program, the 7 steps being modified to the extent necessary to meet South Carolina conditions. Among the procedures and media used in the educational portion of the program were various publications on insect control, timely information provided through newspaper publicity, magazine articles, and on the radio, county and community meetings attended by cotton growers, and personal contact with thousands of growers. Leader training schools, equipment displays, demonstrations of various types, and cotton insect control tours also had an important place in the program. The value of this concerted effort is evidenced by the fact that about 80 per cent of the cotton acreage in the state was treated with insecticides and about 73 per cent of the cotton farmers treated their fields one or more times. The effectiveness of extension programs conducted in other cotton-growing states was also indicated by the reports presented. They emphasized the fact that while insects are a major threat to cotton production, these pests can be controlled if the growers are kept adequately and currently informed of the measures that have been tested thoroughly and that are recommended for use under the conditions existing in their respective areas.

Much interest, of course, centered around the results obtained in 1950 with some of the newer insecticidal materials, especially aldrin and dieldrin, tested against the insect pests of cotton. Aldrin was widely and extensively tested, both as a dust and as a spray. It showed considerable promise in the control of the boll weevil, thrips, cotton fleahopper, tarnished plant bug, rapid plant bug, grasshoppers, and newly hatched cotton leafworms. It was not effective against the bollworm, cotton aphid, or spider mites. Dieldrin was tested against cotton insects in many areas durng 1950. It appeared to be effective when used at low dosages, either as a dust or as a spray, against several of the injurious cotton insects including the boll weevil, thrips, cotton fleahopper, tarnished plant bug, rapid plant bug, fall armyworm, grasshoppers, and the variegated cutworm. The material has not yet been thoroughly tested, however, under the conditions existing in all cotton-growing areas.

Toxicity Discussed

THE problem of toxicity of the insecticidal materials used in the control of cotton insects received considerable discussion by the conferees. It was emphasized that in using any insecticide all precautions should be carefully followed with regard to possible hazards to the user, to livestock, to beneficial insects, to plants, and to soils.

Many of the insecticides and mixtures were widely used as sprays on cotton in 1950. The results generally confirmed those of recent previous years that concentrated sprays of organic insecticides, applied either with ground equipment or airplanes, give control of cotton insects equal to that obtained with dusts.

From the discussions that took place it is clearly evident that growers in all areas now have a wide choice of insecticides for use against the insects and mites that affect the yield and quality of their cotton crops. This is of particular importance in view of the possible shortages that may occur in 1951 with regard to availability of adequate supplies of certain of the materials now commonly used in cotton insect control. The various state agencies will no doubt keep this fact in mind in drawing up their cotton insect control recommendations for the coming season.

A number of entomologists who attended this conference also attended and took an active part in the Fourth Annual Cotton Insect Control Conference sponsored by the National Cotton Council of America at the Hotel Peabody in Memphis on December 7 and 8, as reported on page 39. Claude L. Welch, director of the Production and Marketing Division of the council, stated that effective insect control will be one of the major factors in increasing the yield of cotton in 1951 and in aiding to attain the desired goal of 16,000,000 bales.

•

Barss Retires from USDA

After 40 years with state and U.S.D.A. service, Howard P. Barss, Office of Experiment Stations' botanists retired December 31. He had completed 17 years of service with the U.S.D.A., and before that had headed the department of botany and plant pathology at Oregon State College, Corvallis from 1915 to 1933. His long career was marked by outstanding contributions in the field of plant, disease control, and he is author of more than a hundred publications and articles on this subject. He received a Superior Service Award from the U.S.D.A. in 1949.

Mr. Barss is a native of Canada, and was naturalized in Rochester, N. Y. early in the century.

Succeeding Mr. Barss will be Dr. C. L. Lefebvre, who will serve as specialist in plant pathology in connection with experiment station research in the field of plant diseases.

•

Extend Federal Quarantine

Hearings were scheduled for January 11 in Memphis, Tenn., by the Secretary of Agriculture to consider the necessity for extending the Federal Pink Bollworm Quarantine to include Louisiana. Infestations of the pink bollworm were recently reported from four parishes of the state. This is the third appearance of this pest in Louisiana.

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Technical Briefs

Fungicide Particle Size

The important effect of particle size on the performance of fungicides is brought out in an article, "Mechanism of Particle Size Effects of Fungicides on Plant Protection," by H. P. Burchfield and George L. McNew in the July-September, 1950, issue of *Contributions from Boyce Thompson Institute*. A small number of large particles leads to a superabundance of protectant in some localities, and little or none in others, while subdividing the material tends to equalize the coverage at the various points of infection. The number of particles per unit area, rather than total surface, has been regarded as the primary factor in plant disease control. Increasing the surface increases the rate of solubilization of toxicant and thus increases availability. A general relationship has been proposed which states that the amount of toxicant required for constant disease control varies inversely with the logarithm of the number of particles in which it is subdivided. Experimental work by the authors with "Phygon" in the control of tomato early blight confirmed this theory. They point out that a consideration of particle size effects, together with information on the chemical and physical properties of the toxicant, is often useful in preparing new fungicidal formulations.

•

Basal Bark Brush Control

Five years of testing have indicated basal bark treatment of brush and small trees to be as effective as conventional foliage applications of weed killers according to research workers at Dow Chemical Company, Midland, Mich.

The discovery is expected to open up new possibilities in year-around brush control. In most areas, foliage treatment is possible during only four or five months of the year, whereas the basal bark method is applicable over the full twelve months, and is limited only by severe rainfall, deep snow or exceptionally low temperatures. The company states that various Federal and State research groups have conducted similar tests with equally promising results.

Good results have been obtained from spring, summer, fall and winter applications. The chemical 2,4,5-T has proved more effective than 2,4-D for basal treatment except with a few species, such as willow, that are more susceptible to 2,4-D.

Dow reports that best results were obtained using a mixture at the rate of 1 pint of its product, "Esteron 245" to 3 gallons of Diesel fuel or kerosene. Two factors are important to obtain the best results—the mixture should be thoroughly stirred before application and the basal area should be wet to the point of run-off. In spraying stumps to prevent resprouting, the bark on the sides of the stump should be wet thoroughly as well as the cut surface on the top.

Following dormant treatment some species will leaf out in what appears to be a normal manner, but the effects of treatment almost invariably show up later during the growing season. Some species will fail to leaf out or will foliate only partially and then die back. (*This month's front cover carries illustration of applying herbicides in this manner*).

•

New DDT Formulation

A new DDT formulation for use in preparation of agricultural sprays is now being made by the Du Pont Company. Known as "Deenate" 75-W DDT insecticide, it is a wettable powder containing 75% technical DDT. It will supplant a 50% DDT wettable powder, previously offered by the Du Pont agricultural chemicals section. The new DDT formulation is being advanced as a more efficient product for farm use.

Extensive field tests with the 75% material indicate it will produce a higher deposit of DDT on sprayed surfaces, with less visible residue, the company states. This also will mean a lower poundage of the material will be required per 100 gallons of spray to supply the same percentage of DDT, it is pointed out. "Deenate" 75-W will be offered in a wide range of small package sizes, from one to seven pounds capacity, and in 50-pound bags.

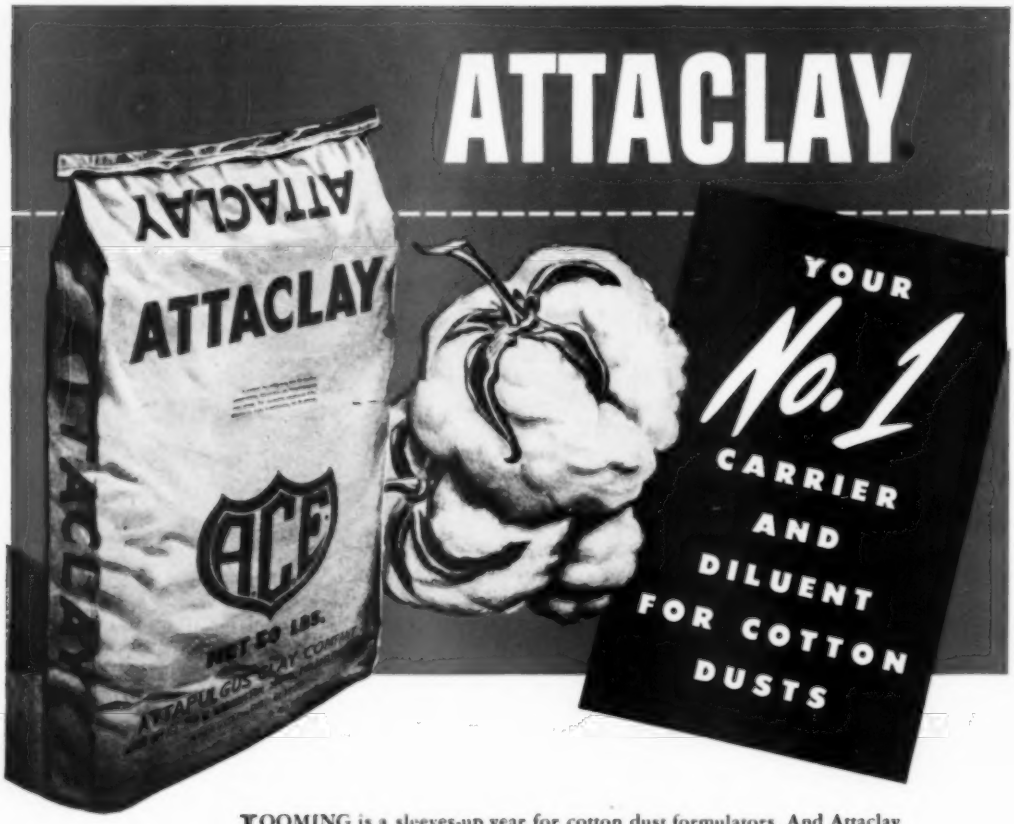
New Systemic Insecticide by Pitts. Agri. Chem. Co.

PITTSBURGH Agricultural Chemical Co., New York, has announced pilot plant production of "Systox" (compound E-1059), a new systemic insecticide. According to William A. Haude, president, the product will be available only in limited quantities for assay and experimental purposes in 1951. There will be continued extension field testing this summer on the product but it will not be on the commercial market until 1952, it was announced.

"Systox" is another of the organic insecticides developed by G. Schraeder of the I. G. Farben Industries in Germany. Schraeder and his group have been experimenting on systemic organic insecticides since 1936 and this was one of several that have been developed.

At the close of the war, a British scientific team was sent into Germany to pick up all discoveries of the Farben Industries. Among the discoveries they made were parathion and octamethyl pyrophosphoramide, which was marketed to a limited extent under the name of "Pestox 3" by the Imperial Chemical Industries, Ltd., of Great Britain. "Pestox 3" was marketed in Britain and France. The latest in this group of new organic insecticides is "Systox".

Research has revealed that systemic organic insecticides are absorbed by the roots, leaves and stalks of certain plants. When thus ab-



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Cotton dust problems? Let's team up to lick them!

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Phila. 5, Pa.

sorbed, the compound is then redistributed by translocation. The plants have been found to be toxic to certain insects long after spray residue has been dissipated by weather and normal chemical breakdown.

Studies with regard to the translocation of "Systox" in the plant have demonstrated the travel of the poison to be predominantly in an upward direction, that is, the chemical travels upward through the plant tissues from a treated area. In tests, a portion of an untreated plant was grafted to a treated plant. The grafted untreated part became toxic to insects after a short period. However, in cases where a treated section of a plant was grafted to an untreated plant, no significant control was noted in insects attacking other than the treated part of the plant, indicating that there is no downward travel of the toxic ingredient.

The systemic insecticide may be applied as a spray, making diluted applications to the plant, or it may be applied to the soil in a water solution and absorbed by the plant. In many cases, seeds may be soaked in a solution of the chemical, thereby being absorbed and held by the young seedlings to give protection against several insects for a number of days.

In one experiment, cotton seed was soaked for 1½ hours in various concentrates of "Systox" and octamethyl pyrophosphoramide. After the treatment, the liquid was poured from the seeds, and from the remaining liquid it was determined how much had been absorbed by the seeds. The results indicated that "Systox" was fatal to aphids at lower concentrations than was octamethyl pyrophosphoramide.

"Systox" is readily taken up by plants and remains in them for prolonged periods of time, killing aphids, mites and some types of chewing insects. Toxicological studies show that this new insecticide is no more toxic to human beings that parathion and several other organic phosphate insecticides. Research so far reveals that there is very little danger of burning the plants from applications of "Systox". Further, there is the possibility of blending the chemical with fertilizers to be applied at the time of planting, or incorporating the chemical with other ingredients that might be used for the pelletizing of seeds.

Small amounts of the formulation of this new insecticide will be available to recognized agricultural authorities and in the near future, sufficient material will be available for large scale field tests, the makers say.

•

New Conditioner, Carrier

Use of expanded vermiculite is reported to be finding favor with manufacturers of fertilizers, weed killers and insecticides as a conditioner and carrier. The material was used previously and currently as an insulation and a light weight aggregate by the building trade.

According to the producers of the product, Zonolite Company, Chicago, physical characteristics of vermiculite make it ideal as a carrier and conditioner. The expanded vermiculite is made by exfoliating vermiculite ore, a type of mica that expands when heated. Expanded, the material has a low density, ranging from 4 to 12 pounds per cubic foot, depending upon the size gradation. Because of the open laminations of the granules, vermiculite can absorb or carry 400% of its weight in liquids, the company points out. Vermiculite will not cake nor stick together, is non-toxic and non-abrasive. Its pH is in the neutral range, from 6.7 to 7.4.

Other favorable physical characteristics of vermiculite, the makers state, are its low weight and the fact that it is 100% fireproof. It will not burn, but on the contrary may halt or retard the spread of fire.

The chemical analysis of vermiculite as announced by the Zonolite Co., is shown below.

	Raw Ore	*Exfoliated*
% Moisture (loss at 105°C)	2.90	1.25
% Silica (SiO_2)	39.30	39.00
% Iron Oxide (Fe_2O_3)	10.96	11.04
% Aluminum Oxide (Al_2O_3)	13.54	14.16
% Titanium Dioxide (TiO_2)	1.30	1.40
% Calcium Oxide (CaO)	1.04	1.08
% Magnesium Oxide (MgO)	19.80	21.90
% Sodium and Potassium Oxides (Na_2O K_2O)	4.80	4.88
% Chlorine (Cl)	Trace	Trace
% Sulfur Trioxide (SO_3)	0.02	0.02
% Loss on Ignition (other than moisture)	5.93	4.85

•

New Fungicide Product

R. T. Vanderbilt Co., Inc. has announced the availability of an experimental seed protectant chemical, called "Vancide 51." It is a 30% solution of the sodium salts of dimethyl dithiocarbamic acid and 2-mercaptobenzothiazole, now in commercial production. Acute toxicity tests determined that the product is not a poison to warm blooded animals, the company states. Long term chronic feeding tests are under way. Although it is too early to report final results, indications are that "Vancide 51" is a safe material. Clinical studies on human subjects indicate the material is not irritating to the skin.

"Vancide 51" can be applied to seed in commercial slurry treaters, and use of this liquid eliminates dusting problems both before and after treating. Field trial results in the 1950 season were good on soybean emergence and yield using 5 oz. "Vancide 51" per bushel, on corn emergence at 2 oz. to 4 oz. per bushel, and on sorghum emergence and smut control at 4 oz. per bushel. This formula is marketed at a lower price per pound than other seed protectant chemicals; consequently, higher dosages may be used economically.

Indoor trials on a large variety of seeds show that "Vancide 51" is effective against fungi that attack seeds and is not harmful to the seeds

(*Turn to Page* 90)

'Nuff said

Matt: Don't look now, fellows, but isn't that someone looking at this ad.

Hank: By gosh, you're right Matt. I can see him eyeing the Geigy emblem. He's probably thinking, "Uh-huh, the Geigy Company. The originators of DDT insecticides. Wonder what they're jawing about this time? And what are those guys doing around that stove?"

Bill: I hope he doesn't think we're just three stooges for Geigy and all we do is plug their products.

Hank: Yeah, you've said it all when you say that Geigy outfit really delivers when the bugs are bitin' hardest.

Matt: 'Nuff said. Now, how d'you think the White Sox will make out this year?

Hank: Yeah, we've gotten darn good results from Geigy materials—

Matt: 'Nuff said. The White Sox should—

Bill: A lot of folks sure used a lot of Geigy products last year and—

Matt: 'Nuff said. The White—

Hank: And Geigy sure has got a complete line of farm chemicals—

Matt: Whoa! The—

Bill: Right, Hank, and if the folks will follow the Geigy ads in "Agricultural Chemicals" they'll see what we mean.

INSECTICIDES—FUNGICIDES—WEED KILLERS—DEFOLIANTS—FUMIGANTS

ORIGINATORS OF Geigy **DDT INSECTICIDES**

GEIGY COMPANY, INC.
89 BARCLAY STREET, NEW YORK 8, N. Y.
DEALER & DISTRIBUTOR INQUIRIES INVITED

All phases of chemical weed control; Results of past year's tests noted at

Northeastern Weed Conference

THE fifth annual session of the Northeastern Weed Control Conference was held at the Hotel New Yorker, New York City, January 3-5. The program covered all phases of the weed control problem, emphasizing the importance of herbicidal chemicals in achieving greater agricultural production.

The group elected as president for 1951, S. M. Raleigh, Pennsylvania State College, State College, Pa., to succeed H. L. Yowell, Esso Laboratories, Elizabeth, N. J. Vice-president is C. E. Minarik, Camp Detrick, Frederick, Md., who replaces Mr. Raleigh. W. C. Jacob, Long Island Vegetable Research Farm, Riverhead, L. I., was re-elected as secretary-treasurer. Announcement of the new officers was made at a luncheon program Wednesday noon.

A tentative report of the Research Coordinating Committee was presented to the meeting, with suggestions for its revision being heard from the floor on the last day of the meeting. The report, which covers weed control in field and sweet corn, small grains, forage crops, pastures, perennial grasses, vegetables, etc., had not been completed in its final form at press time; but copies were to be available from Dr. R. D. Sweet, Cornell University, Ithaca, N. Y., later this month.

Heavy Schedule Followed

MORE than 60 papers were presented before the conference. Scientists from most of the eastern states gathered for the three day meeting to give the results of their latest research on the control of weeds.

Paul J. Linder of the USDA reported on a series of experiments to study the methods of absorption of some of the newest organic herbicides by plants. His research indicated that sodium 2,4-D ethyl sulfate, IPC, chloro IPC and phenyl mercuric acetate are relatively more toxic when applied to the soil around bean and oat seedlings than when applied to the stems or leaves. Maleic hydrazide and 3, 6-endoxohydrophthalates, however, are as effective when applied to the stem as when applied to the roots.

A new theory for the mechanism of plant tolerance and susceptibility to oils was advanced by S. L. Dallyn and R. D. Sweet of Cornell University. The fact that carrots and related plants are not killed by Stoddard Solvent sprays, while most weeds and other crops die, is explained on the basis of a difference in cytoplasmic membranes of the plant cells which prevent the entrance of oil into the cells of the tolerant plants.

L. J. King and J. A. Kramer of Boyce Thompson Institute report-

New officers named at N. E. Weed control conference in New York. L to R: C. E. Minarik, vice-president; S. M. Raleigh, president, and W. C. Jacob, secty-treas.

Right: New president is congratulated by H. L. Yowell, outgoing head of conference.

ed that the hazardous effects of 2,4-D vapor drift on nearby sensitive crops may be largely eliminated. Results of their experiments showed that the polyethylene glycol esters of 2,4-D compare favorably in toxicity to regular 2,4-D compounds, but are less volatile.

The hand labor required to raise a crop of strawberries was reduced by two-thirds where chemical weed control was used, R. F. Carlson and J. E. Moulton of Michigan State College reported. 2,4-D and a material called "Experimental Herbicide No. 1" gave excellent weed control without injury to the berry plants or fruit.

In reporting on weed control studies at Seabrook Farms, Bridgeton, N. J., T. P. Finn and L. J. King stated that "Experimental Herbicide No. 1" controlled weeds effectively in asparagus and corn without affecting the yield or tastes of either crop.

A simultaneous control of weeds and insects in strawberries with a single chemical was reported by L. L. Danielson and R. N. Hofmaster of the Virginia Truck Experiment Station. Herbicidal concentrations of "Sinox General" not only killed chickweed and henbit but also gave excellent control of the two-spotted spider mite.

According to C. E. Cross of the Massachusetts Cranberry Experiment Station, Cape Cod cranberries are now weeded chemically on a limited scale. Stoddard Solvent, 2,4-D and copper sulfate are three of the more common materials being tried.

Weeds in Potatoes

CHEMICAL weeding of potatoes is not yet commercially practical according to J. H. Ellison and W. C. Jacob of Cornell University. Results of two years indicate that normally cultivated potatoes will outyield uncultivated chemically weeded fields. In all cases the treatments affording the best weed control also produced the largest yields. Normal cultivation was superior in this respect.

A less expensive means of controlling weeds in the 100,000 acres of dry beans raised in New York, was advanced by A. J. Tafuro and John Van Geluwe of the Co-op. G.L.F., Inc. Water soluble dinitro materials ("Premerge" and "Sinox PE") consistently gave best residual weed control and eliminated two cultivations.

Two relatively new chemicals were reported by P. W. Zimmerman, A. E. Hitchcock and H. Kirkpatrick, Boyce Thompson Institute, Yonkers, N. Y., as possessing defoliating properties. Undecylenic acid and monochloracetic acid removed rose, bean and fruit tree leaves and in addition were reported to be effective as weed-killers.

Maleic hydrazide appears to be effective as a quack grass killer, according to W. E. Snyder of Cornell University. This material either reduced or inhibited growth depending on the concentration used, and was more effective than trichloroacetate.

The effectiveness of 2,4-D, sodium arsenite and trichloroacetic acid were increased by the addition of wetting agents, according to E. R. Laning, Jr. and R. J. Aldrich of Rutgers University.

A. J. Tafuro and John Van Geluwe of the Cooperative G.L.F., Inc., Ithaca, reported that 2-methyl, 4-chloro-phenoxyacetic acid gave excellent control of wild mustard without hurting ladino clover or alfalfa. This compound is related to 2,4-D, but its weaker action appears to make it safe for use on legume seedlings.

Herbicides Help Milk

THE production of off-flavor milk by cows eating wild garlic plants may be reduced by chemical weed killers, according to S. M. Raleigh of Penn State. Treated once each spring for three years with 2,4-D, wild garlic was controlled effectively.

Increased milk production in the east through pasture improvement by use of chemical weed killers is the prediction of John Van Geluwe and C. V. Flagg of the Coop. G.L.F., Inc. Cut stumps of the hard-to-kill pasture weed, thorn apple, were prevented from resprouting by applications of 2,4-D and 2,4,5-T in oil.

The use of repellents offers a possible solution to the problem of toxicity of sodium arsenite when its use is contemplated as a herbicide or soil sterilant according to a paper by R. E. Frans and R. J. Aldrich of Rutgers University. "Z.I.P." and "Z.A.C." sprayed on arsenite treated pastures caused cows to avoid the area.

An evaluation of ten crabgrass killers by Gene Nutter and John Cornman, Cornell University, indicated that phenyl mercuric acetate, potassium cyanate and dichloral urea performed the best.

Means of altering the effectiveness of potassium cyanate for crabgrass control were discussed by R. H. Beatty and B. H. Davis of the American Chemical Paint Co., Ambler, Pa. They concluded that several applications of the herbicide were necessary for weed control and that there was an advantage of mixing 2, 4-D with the cyanate. A fairly fine spray is necessary for best results.

Chemical treatment of brush along roadsides by highway departments can be more effective by the use of 2,4,5-T, A. M. S. Pridham of Cornell University reported. Seedlings of ash up to an inch in diameter were killed by basal sprayings of 2,4,5-T in oil, during the winter months.

Utility corporations should not always regard grass as the ideal ground cover according to F. E. Egler of Norfolk, Conn. Desirable shrublands have a remarkable ability to resist invasion of unwanted woody plants which may allow them to be maintained at a lower cost than grasslands.

The majority of all herbaceous vegetation growing under guard rails along highways can be eliminated for a six week period by timely spraying with herbicidal formations according to Harry Iurka, Dept. of Public Works, Babylon, N. Y. and A. M. S. Pridham, Cornell University. Tests were run in three districts of the state using many different chemicals.

Research in six southeastern states with chemical herbicides for track treatment of railroad as reported by J. P. Taylor indicated that a combination of sodium chlorate and sodium trichloroacetate gave best results on the most prevalent types of vegetation.

Suppliers' Bulletins

Circular on "Dieldrin"

Julius Hyman & Company have announced availability of a new circular No. 500 giving general information on experimental use of "Dieldrin" for agricultural and public health insect control. Copies of the folder are available by addressing the company at Denver, Colorado.

■

Alrose Presents Catalog

Alrose Chemical Co., Providence, R.I., has issued a new catalog, "Surface Active Agents and Organic Chemical Specialties." Described in the eight-page booklet are sequestering agents, non-ionic emulsifiers for agricultural sprays, and products useful in other applications. The products, "Alrodynes," non-ionic emulsifiers, are said to be relatively non-toxic non-ionic polymeric emulsifiers for spray concentrates such as DDT, chlordane, methoxychlor, lindane BHC, toxaphene and the esters of 2,4-D.

Write the Alrose Chemical Co., Providence, R.I., for a copy of the catalog.

AC Now On Microfilm

Agricultural Chemicals is now available to libraries and others on microfilm, according to an announcement by University Microfilms, Ann Arbor, Mich. The company is photographing, page by page, current issues of leading magazines in various fields, and making them available to libraries which do not have storage space for large numbers of magazines. The microfilm volumes cost $3.50 each.

Issues Publication List

Cornell Extension Bulletin 47 has been issued by the New York Agricultural Experiment Station listing publications available from this source. The topics include entomology, fertilizers, plant diseases, and weed control in addition to numerous other subjects pertaining to agricultural production. The list is available from the Cornell Dept. of Extension Teaching & Information, Ithaca, N. Y.

■

Issues Fumigant Info

American Cyanamid Co., New York, has issued a new bulletin, No. 9, describing the principles and practices of controlling insect infestations in grain with "Cyanogas" (Calcium cyanamid) fumigant. Instructions are presented for its use, with cautions and other information. Write American Cyanamid Co., Agricultural Chemicals Division, Insecticide Dept., 30 Rockefeller Plaza, New York 20.

■

Article on Barden Clay

J. M. Huber Company, New York, tell the story on their insecticide diluent, Barden Clay, in the September-October issue of "Huber News," company house magazine. In developing this new insecticide diluent, Huber worked directly with manufacturers of various toxicants including Industrial Chemicals, Inc. and Velsicol Corporation .

The test work showed Barden Clay to be a diluent for both pyrethrum and chlordane. Other tests showed that the product worked very well with DDT, BHC and with copper salts and sulphur. The article is well illustrated with photographs showing production, testing and application of insecticide dusts in the field. Copies of "Huber News" are available by addressing the company at 42 Madison Avenue, New York.

■

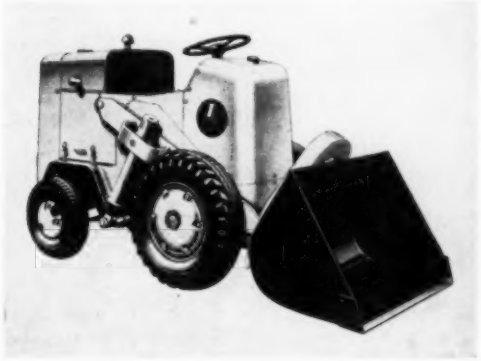
Streamlined Granulator

A new oscillating granulator has been announced by F. J. Stokes Machine Co., Philadelphia. Constructed of welded stainless steel, the hopper has a smooth inside finish for easy cleaning, the makers point out.

Features of the machine include its leakproof construction, high-strength gearing with many moving parts sealed in oil, and protection of the motor against dust and dirt. The makers state that all pockets and points where dust may collect, have been eliminated. Literature on the machine, designated as the 43B granulator, is available from the company, 5900 Tabor Rd., Philadelphia, Pa.

Offer New "Payloader"

Frank G. Hough Co., Libertyville, Ill., has announced production of a new and improved Model HA "Payloader." This small, compact 12 cu. ft. tractor-shovel has found wide use in unloading and moving bulk materials such as fertilizer. The new model HA is said to be faster, more powerful and more rugged than the model it replaces. It features a new higher compression engine, said to give more power and economy.



(Left) New Hough "Payloader" Model HA, featuring increased power and economy of operation for fertilizer plants.

INDUSTRY NEWS

Campbell Joins FMC

Food Machinery and Chemical Corporation, San Jose, Calif., has announced that professor William L.

WM. L. CAMPBELL

Campbell, head of the food technology department of the Massachusetts Institute of Technology, would become a vice-president of the corporation and assume executive staff duties at the company's home office in San Jose, California, effective January 1. Professor Campbell, who has been associated with M.I.T. since 1945, was responsible for organizing the institute's food technology department. During World War II, professor Campbell was vice-president of the American Machine Defense Corporation of New York, served as assistant deputy rubber director, was a consultant to the Army and Navy on production problems, and was a member of the board of technical advisors of the Quartermaster General's Office.

A native of Cincinnati, Ohio, he is a graduate of Yale University, took post-graduate work in engineering at the Massachusetts Institute of Technology, and holds a law degree from Boston College.

•

Texas Fertilizer Meet

The Texas Fertilizer Conference was to be held at College Station, Texas, January 10 and 11. The advance program called for a 10 a.m. session Wednesday morning, with C. N. Shepardson, chairman. On the program were to appear C. D. Shallenberger, J. D. Prewitt, and J. B. Page. The afternoon program was to have J. E. Adams as chairman, with talks by J. R. Johnston, R. H. Wyche, C. A. Burleson, H. C. Hutson and J. F. Fudge. The morning session of Thursday was to be under the chairmanship of Dr. Fudge, with talks by W. O. Cox, M. K. Thornton and R. D. Lewis.

Subjects to be discussed included the national cotton program for 1951, fertilizer usage in Texas and adjacent regions, the pasture program in Texas, and a talk on European agriculture by Dr. C. E. Furgeson, Economic Cooperation Administration.

•

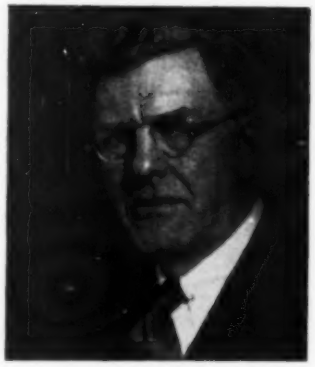
Wisconsin Session Held

Under the sponsorship of the University of Wisconsin department of economic entomology, the fifth annual Insect Control Conference with Industry was to be held January 10 and 11 at the Loraine Hotel, Madison. The advance program for the two-day meeting called for a session Wednesday morning under the chairmanship of T. C. Allen, with papers by R. D. Dicke, G. Moore, K. Ihde, D. Dever and C. L. Fluke. The afternoon program was under the chairmanship of S. D. Beck, with papers being presented by T. C. Allen, H. G. Simkover, R. D. Shenefelt, H. Ball, M. Barrow, and J. T. Medler.

E. H. Fisher was to be chairman of the Thursday morning program which was scheduled to hear papers by E. L. Chambers, J. W. Apple, N. Miller, T. Davich, and T. E. Bronson. Mr. Allen was slated as chairman for the final session on Thursday, which, in addition to papers by R. K. Chapman and A. Whipp, was to feature a panel on the present role of systemic insecticides.

Rohwer Defense Assistant

Dr. S. A. Rohwer of the U. S. Department of Agriculture, has just been named special assistant for de-



S. A. ROHWER

fense in the Agricultural Research Administration by Dr. P. V. Cardon, ARA Administrator. In his new position Dr. Rohwer will be the Administrator's special representative in spearheading ARA defense efforts. He will represent the administrator in relationships with the Production and Marketing Administration under the Defense Production Act and related executive and administrative orders; and activities coming within the purview of the National Security Resources Board. He will be ARA liasion officer with the Federal Civil Defense Administration, and with the Munitions Board and the Research and Development Board of the Defense Department.

During World War II Dr. Rohwer presented the needs for insecticide chemicals to the War Production Board, representing the Nation's farmers and the insecticide industry. For his service during the war he was awarded the Superior Service Award by the Secretary of Agriculture in 1947. Dr. Rohwer is a native of Telluride, Colorado. He

attended the University of Colorado which honored him with a Doctor of Science degree in 1948. He has been with the Department of Agriculture since 1909.

•

Minn. Short Course in Feb.

An aircraft spraying and dusting short course is scheduled to be held at the University of Minnesota farm, St. Paul, February 7 and 8, according to J. O. Christianson, director of Agricultural Short Courses for the University.

Purpose of the course is to "present the results of insect and weed surveys with special reference to 1951 infestations, and to discuss the control of insects and weeds in 1951," it was stated. Other topics to be discussed include new insecticides, herbicides and fungicides as well as mechanical aspects of application. Timing, rates of application, state and federal regulations, and grower-pilot relations are also on the agenda for discussion.

A fee of $5 will be charged for the two-day course, and will include copies of abstracts of the short course. Registration and sessions will be held in Coffey Hall, St. Paul campus of the University.

•

Midwest Shade Tree Meet

The Midwestern Chapter of the National Shade Tree Conference will be held at the LaSalle Hotel, Chicago, February 14-16. Subjects to be discussed include weed control, plant disease control, and the control of various insects. Thomas J. Lynch, arborist, Winnetka, Ill., will speak on "Mosquito and Fly Control with Chemicals"; James E. Kuntz, University of Wisconsin, Madison, will talk on "Developments in Oak Wilt Research"; and B. H. Grigsby, Michigan State College, East Lansing, is to discuss "Some Aspects of the use of 2,4-D in Arboriculture."

Controlling Dutch Elm disease will be discussed by Roger U. Swingle, U.S.D.A., Columbus, Ohio; and J. E. Bussart, Velsicol Corp., Chicago, will talk on "Scale Insects and Control Methods."

Earl V. Hardenburg Dies

Earl V. Hardenburg, 61, professor of vegetable crops at Cornell University, Ithaca, N. Y. died December 4, 1950. Active in research, he was the author of numerous articles and books on fertilizer ratios and placement, dry beans, crop survey methods and factors affecting the yield of potatoes.

Born in Brocton, N. Y., Professor Hardenburg graduated from Cornell University in 1912 and joined the faculty. In 1919, he received his PhD and was appointed assistant professor, and in 1926, a professor. Dr. Hardenburg was a past president of the Potato Association, a founder of the Empire State Potato Club, Fellow in the American Association for the Advancement of Science.

MEETINGS

3rd Illinois Custom Spray Operators Training School, University of Illinois, Urbana, January 18-20.

California Weed Control Conference, Fresno State College, Fresno, Calif., Jan. 30 to Feb. 1.

Eleventh Annual Southern P.C.O. Conference, Louisiana State University, Baton Rouge, La., Jan. 29-31.

Association of Southern Agricultural Workers, Peabody Hotel, Memphis, Tenn. Feb. 5-7, 1951.

Third Annual Aircraft Spraying & Dusting Short Course, University of Minnesota Farm, St. Paul, Feb. 7 & 8.

Southern Weed Conference, Hotel Claridge, Memphis, Tenn., Feb. 8 & 9.

National Canners' Association, Hotel Stevens, Chicago, Ill., Feb. 14-23.

Midwestern Chapter, National Shade Tree Conference, La Salle Hotel, Chicago, Ill., Feb. 14-16.

Kansas State Weed Conference, Topeka, February 15 & 16, 1951.

1st Annual Meeting, Southwestern Branch A.A.E.E., Adolphus Hotel, Dallas, Tex., Mar. 1 & 2.

South Dakota State Weed Conference, Corn Palace, Mitchell, S. D., March 14 & 15.

N. Central Branch, A.A.E.E., Commodore Perry Hotel, Toledo, Ohio, March 21 & 22.

Short Course on Use of Aerial Equipment in Agriculture, Purdue University, Lafayette, Ind., March 30 & 31.

Nat'l Agricultural Chemicals Assn, Flamingo Hotel, Miami Beach, Fla. April 4, 5 & 6, 1951.

American Chemical Society, 119th Meeting, Hotel Statler, Boston, Mass., April 1-5; Hotels Statler and Cleveland, Cleveland, Ohio, April 8-12.

Expands Allethrin Output

McLaughlin Gormley King Co., Minneapolis, has announced that they are expanding their production of allethrin for military aerosols. It was stated that the present plans call for facilities to produce a substantial portion of the anticipated military and civilian needs.

■

Cyanamid Names Wilkerson

T. L. Wilkerson

American Cyanamid Company has announced the appointment of T. L. Wilkerson to the position of general sales manager for its Agricultural Chemicals Division.

Mr. Wilkerson has served with American Cyanamid Company for 25 years as agriculturist, salesman and technical representative to fertilizer mixers. Prior to his new appointment he was general field supervisor of the Agricultural chemicals Division with headquarters at Toccoa, Georgia.

A graduate in agriculture from Mississippi State College, Mr. Wilkerson also did post-graduate work at Louisiana State College after which he conducted work on cotton insects at the Cotton Experiment Station, Tallulah, Louisiana. He was later County Agricultural Agent in Tensas Parish.

•

Guy H. Parham Dies

Guy Henry Parham, assistant secretary and treasurer of Knoxville Fertilizer Co., Knoxville, Tenn., died December 7. He had been associated with the company for 27 years.

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PASTED VALVE TYPE

SEWN VALVE TYPE

OPEN MOUTH PASTED BOTTOM

OPEN MOUTH SEWN BOTTOM

Delaney Committee may Continue Investigation

A RESOLUTION to continue the investigation of the Delaney Committee into the subject of protecting the public against the possible contamination of foods by chemicals was contained in an interim report of the committee, issued Jan. 4th. "Increasing use of chemical additives in the production and processing of foods has raised a serious problem as far as public health is concerned," the committee warned.

An amendment has been proposed to the Food, Drug and Cosmetic Act which would require that chemicals such as insecticides, fungicides, herbicides, etc., for use on or in foods, would have to be checked and passed as safe for use by the Food and Drug Administration before their use would be permitted. The committee is apparently not anxious to rush into such legislation before hearing more evidence however. They concluded in their report that "in view of the far-reaching consequences of such an amendment, the committee is of the opinion that individuals and groups who would be affected by such legislation should be given further opportunities to present their views and to comment on proposed legislation before any specific recommendations are made to Congress."

One section of the Committee's report dealing specifically with fertilizers, gave commercial fertilizers a clean bill of health. The report noted that some of the nation's most eminent soil and plant scientists had testified that the use of chemical fertilizers does not injure the soil and is not responsible for any of man's illnesses. "No reliable evidence was presented that the use of chemical fertilizers has had a harmful or deleterious effect on the health of man or animal," the report concluded.

Shell Expands Plant

Shell Chemical Corp., New York, has announced further expansion of its synthetic ammonia plant, located at Shell Point, near Pittsburg, Calif. The company states the move is to meet demands of agriculture and industry on the Pacific Coast. The output of the Shell Point synthetic ammonia plant has been increased four times during the past twenty years of its operation. The latest expansion will represent an increase in output of over 300 percent over that of the past ten years.

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Tentative Insect Program

An Insect Control Conference was to be held at the Hotel Bentley, Alexandria, La., January 9 and 10, 1951. Purpose of this meeting was to familiarize people called upon to furnish farmers with information on insecticdes.

The program chairman, Rudolph G. Strong, Louisana Agricultural Extension Service, University Station, Baton Rouge, La. announced in December that subjects to be discussed would include the insecticide supply situation; the cotton plant in relation to insect control; cotton insects; uses and limitations of insecticides; application of cotton insecticides; and the sugarcane borer.

•

A&S Complete Expansion

The completion of a $55,000 plant expansion program at the Canajoharie plant of Arkell and Smiths has been announced recently by S. S. Yates, chairman of the board of directors and president of the company. This step marks the final phase of a two year expansion program in all three of the company's plants. The addition of the warehouse space and manufacturing area has made possible economies of operation and handling which had been impossible previously.

The installation of a high speed web specialty printing press in January is expected to increase the specialty bag capacity of the Canajoharie plant by approximately 50%. In addition to bags for insecticides and fertilizers, this plant also manufactures bags for coffee, flour, dog food, limestone, and cement.

•

Reports Fertilizer Output

TVA research has aided the commercial fertilizer industry in improving their products, and expanding the capacity of the industry, the Tennessee Valley Authority claims in its annual report just submitted to Congress with the opening of the new 82nd session. A large number of industry representatives visit its experimental plants, the TVA report states, and continues: "Drawings, specifications and similar materials have been loaned to industry representatives to assist them in building electric furnaces and applying other TVA findings to their own operations. In special instances actual testing and development have been carried out in TVA laboratories to assist commercial producers."

In the fiscal year ended June 30, 1950, the TVA produced 125,400 tons of concentrated superphosphate and 136,000 tons of amonium nitrate fertilizer. These figures are reported to be less than 5% of total U. S. output.

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English to Baker Firm

William H. English, Jr., former president of the New York Coffee and Sugar Exchange, has been admitted to partnership in H. J. Baker & Bro., New York fertilizer firm.

•

Offers New Rodenticide

Tobacco By-Products & Chemical Corporation, Richmond, Virginia, are now marketing "Black Leaf" warfarin rat and mouse killer. The active ingredient, warfarin, was developed by Wisconsin Alumni Research Foundation and has been tested by various Federal and State agencies with exceptional results in rodent control.

THOMPSON-HAYWARD

FARM-TESTED CHEMICALS

PHENACIDE
(TOXAPHENE)
TOXICHLOR
(CHLORDANE)
DED-WEED
(2,4-D)
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(DDT)
TRI-6
(BHC)

It will pay you to book your insecticides, weed killers and similar products for next summer's selling season now. Demand may quite possibly exceed the supply with resulting price increases. Orders booked with us now for later delivery are protected against price rises and will be given the benefit of any declines that might occur. Write us in regard to your needs today.

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Calif Weed Control Conference Jan 30

JANUARY 30, 31 and February 1 are the dates set for the third annual California Weed Control Conference to be held on the Agricultural Campus of Fresno State College, Fresno, Calif. A. S. Crafts, Calif. Agricultural Experiment Station, Davis, and president of the California Weed Control Conference, will be chairman of the opening session on Tuesday. Appearing on this program will be Paul F. Sharp, director of the Agricultural Experiment Station at Berkeley; J. Earl Coke, director of the Calif. Agricultural Extension Service, Berkeley; and Walter S. Ball, chief of the Calif. Bureau of Rodent and Weed Control, Sacramento.

The afternoon session will hear discussions on local weed problems, with Waldo W. Weeth, Coalinga, Calif., farmer, as chairman. In the evening a panel discussion on "What's New in Weed Control" will be featured, along with a quiz period in which the panel members will participate. W. A. Harvey, secretary-treasurer of the conference, will be chairman.

Problems of brush clearance and improvement and management of ranges will be discussed on Wednesday morning, with B. A. Madson, professor of agronomy, Calif. Experiment Station, Davis, as chairman. The afternoon session will feature a study of weed control in untilled areas, along irrigation canals, highways and railways. Paul Baranek, Bureau of Reclamation, will be chairman. Wednesday evening is set aside for the annual banquet.

Education for weed control operators is the subject for Thursday, with W. W. Robbins, professor of Botany, as instructor. The chemistry and application of herbicides will be discussed by Drs. Crafts and Harvey, respectively. Regulatory weed control problems will be the subject of the final session Thursday afternoon. Chairman will be Charles V. Dick, chief of the Calif. Dept. of Agriculture's Division of Plant Industry, Sacramento.

Officers of the C.W.C.C., in addition to president Crafts ond secretary-treasurer Harvey, include Murray R. Pryor, vice-president. Mr. Pryor is field superviosr of weed control in the Calif. Dept. of Agriculture.

Egyptian Fertilizer Plant

Egyptian Fertilizer & Chemical Industries Co., Cairo, held a general meeting of the stockholders recently to approve an increase in the company's capital, made necessary by the building of a pumping plant at Suez and the installation of a packing factory to increase production. The managing director announced that the company would start production in April, 1951.

•

Brown to Arkell & Smiths

Tom W. Brown, Jr. has recently been appointed Southern Sales Manager of Arkell and Smiths, manufacturers of fertilizer bags. Mr. Brown has previously been Texas Divisional Sales Manager. He will move his headquarters from Houston, Texas to Mobile, Alabama where Arkell and Smiths have their new large southern multiwall bag plant.

•

Fertilizer Increase Seen

Aikman Ltd., London, announced in its annual report to the British nitrogen industry that increasing food requirements during the next few years will necessitate substantial increases in the consumption of fertilizers. The report estimated that the world stock of pure nitrogen on June 30, 1951 will be no more than 285,000 tons, which is equivilant to 23 day's production. The firm predicted that estimated production for 1951-2 and 1952-3 will barely reach estimated consumption.

•

Gen. Chem. Ups Biddison

General Chemical Division of Allied Chemical & Dye Corp., New York, has announced the advancement of Mark M. Biddison to the position of executive vice-president. A member of the General Chemical organization for 33 years, Mr. Biddison has served as a vice-president since 1947.

He began his career with the company in the sales department, acting in various capacities, including manager of the Cleveland office and manager of sales.

From 1934 on, he served successively as assistant general manager and general manager of the company before becoming vice-president.

•

S. Dakota Weed Conference

The South Dakota State Weed Conference is scheduled to be held at the Corn Palace, Mitchell, S. D., March 14 and 15, according to Charles J. Gilbert, State Weed Supervisor.

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Davison Advances Goodall

R. D. Goodall has been appointed assistant to the vice-president-marketing of Davison Chemical Corp., assuming among other responsibilities those for advertising and public relations, it was announced recently by R. L. Hockley, Davison's vice president in charge of marketing. Mr. Goodall has been with the firm since 1939.

He will be succeeded as general sales manager-industrial division by Norman E. Hathaway.

•

Southern Ag. Workers Meet

Memphis, Tenn., is the location of the 48th annual meeting of the Association of Southern Agricultural Workers, to be held February 5-7, at the Hotel Peabody.

Hotel Claridge, Memphis, is to be headquarters for the Southern Weed Conference to follow the ASAW meeting on February 8 and 9.

According to B. B. Jones, ASAW secretary, general sessions will be held each day from 11 to 12:30 at the Peabody, with other groups meeting afternoons and evenings at the Claridge. A registration fee of $2 will be charged, Mr. Jones indicated.

IT'S LION FOR ONE STOP Nitrogen Service FOR FERTILIZER MANUFACTURERS

Lion Anhydrous Ammonia—Manufactured in Lion's modern plant to an 82.25% nitrogen content under accurate chemical control, the uniformity and high quality of this basic product are assured.

Lion Aqua Ammonia—This product is available to manufacturers for use in the formulation of mixed fertilizers or for sale as direct application material. Normally about 30% ammonia, its content can be controlled by order to suit your needs.

Lion Nitrogen Fertilizer Solutions—Made specifically for the manufacturing of mixed fertilizers, these products supply both ammonia nitrogen and nitrate nitrogen in the ratios desired. They are easily handled and available in three types designed for varying weather conditions, and for formula requirements in the production of fertilizers that cure rapidly, store well and drill evenly.

Lion Ammonium Nitrate Fertilizer—The improved spherical white pellets in this product contain a guaranteed minimum of 33.5% nitrogen. They flow freely, resist caking and store much better. Lion Ammonium Nitrate Fertilizer is shipped in 100-pound, 6-ply bags with two moisture-proof asphalt layers.

Lion Sulphate of Ammonia—This new, superior-type sulphate is guaranteed to contain a minimum of 21% nitrogen. Through special conditioning of the larger crystals, moisture and free acid content is greatly reduced. These factors, together with the special coating applied, make for greater resistance to caking in shipment or in storage. This product flows freely. It is shipped in bulk and in 100-pound, 5-ply bags laminated with asphalt.

LION

Technical advice and assistance to fertilizer manufacturers in solving their manufacturing problems is available for the asking. Just write.

"Serving Southern States"

LION OIL COMPANY CHEMICAL DIVISION EL DORADO, ARKANSAS

New BHC Plant

The Columbia Chemical Division of Pittsburgh Plate Glass Company has under construction at Natrium, W. Va., a new plant designed for the production of benzene hexachloride, according to an announcement by E. T. Asplundh, vice president. The product is used principally in insecticide compounds for dusting cotton.

Columbia Chemical Division, one of the nation's largest merchant producers of chlorine, is diversifying its manufacturing operations into products which utilize chlorine in their chemical composition. Benzene hexachloride is composed of 73% chlorine and 27% benzene. With BHC in short supply, potential consumption is beyond the chemical industry's present production capacity, it was pointed out.

The new plant is expected to be completed in March or April, 1951 depending on the ability of equipment manufacturers to meet delivery schedules.

•

Cannon to Calspray Board

Earl W. Cannon, vice-president and manger of the marketing department of California Spray-Chemical Corp., Richmond, Cal., has been made a member of the board of directors of the corporation. A graduate of the university of California, Mr. Cannon joined the company as field representative in 1929.

•

Oregon Seed Growers Meet

The 10th annual convention of the Oregon Seed Growers League was held December 18-20 at the Multnomah Hotel, Portland, Oregon. The program on Monday was devoted to weed control, with round table discussions and the presentation of papers on various aspects of weed control. M. J. Belton, weed inspector, discussed control of perennial weeds in the Columbia basin; Carl Robertson, fruit and vegetable grower, told of weed control activities in this field; J. T. McDermid, Red Hills Experiment Station, Oregon City, talked on "Grass for Weed Control"; and Rex Warren, on "Weed Control on Unplowed Lands." A talk on Wednesday, "Weeds Grow in California, too", was presented by W. A. Harvey, Davis, Calif.

Reports of committees included activities in the use of defoliants, fertilizers, and soil analyses, in addition to studies on legislation, pollinization and harvesting methods. 1950 officers of the League were Carey Strome, Junction City, Ore., president; Jim Short, Redmond, vice-president and E. R. Jackman, Corvallis, secretary-treasurer.

•

Purdue Aerial Conference

The third annual conference on the use of aerial equipment will be held at Purdue University, Lafayette, Indiana on March 19th and 20th, 1951. The program will cover a short course on the use of aerial equipment in the application of chemicals, seeds and fertilizers in dust or spray form.

•

AAAS Agri. Symposium

A symposium on agricultural chemicals was included on the program of the 117th annual meeting of the American Association for the Advancement of Science, Cleveland, Ohio, December 26-30. The symposium, under the chairmanship of Dr. Hal G. Johnson, Monsanto Chemical Co., St. Louis, covered the development and testing of new pesticides, as well as a resume of progress over the past decade. Appearing on the program, in addition to Dr. Johnson, were Dr. J. D. Wilson, Ohio Agricultural Experiment Station, Wooster, Ohio; Dr. W. H. Tisdale, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.; Dr. L. V. Sherwood, Monsanto Chemical Co., Dayton, Ohio; J. M .F. Leaper, American Chemical Paint Co., Ambler, Pa.; John C. Dunnegan, U.S. D.A., Beltsville, Md.; J. L. Horsfall, American Cyanamid Co., New York; Dr. George L. McNew, managing director, Boyce Thompson Institute, Yonkers, N. Y.; and L. A. Long, editor, *Agricultural Chemicals*, New York. The symposium was held on the last day of the meeting, December 30.

•

Constructs Storage Tanks

Illinois Anhydrous Ammonia Co., has announced that three 30,000 tanks have been erected in Farmer City, Ill., to serve as a new bulk plant. The tanks will store liquid

Horsfall Accepts Phytopath Office at Memphis

Dr. James G. Horsfall, director of the Connecticut Agricultural Experiment Station, New Haven, (left), accepts gavel as newly-elected president of the American Phytopathological Society. Holding the gavel is Dr. C. M. Tucker, University of Missouri, Columbia, 1950 president of the Society. Ceremony took place at recent APS annual meeting in Memphis, Tenn.

nitrogen and the company will use its own machines to apply it to the soil. Operators of farms will subscribe for the service, which will probably run around $11 an acre, according to a company spokesman.

•

NPA Confers on Sulfur

Sulfur producers met with National Production Authority officials at a conference in Washington on December 12, 1950 to discuss the nation's capacity for meeting the demand for sulfur. The producers stated that the demand for sulfur in 1951 will considerably exceed production.

NPA officials stated that several interested government agencies are considering the question of how much sulfur must be exported in 1951 to avoid undue hardships to friendly nations which depend on the U. S. for supplies.

Discussions indicated that foreign pyrite sources can be developed to substitute for sulfur, but time and cost will make this a relatively long-range development which can offer no immediate relief.

NPA suggested that it might be necessary to divert a quantity of sulfur to build up reserves rather than permitting 1951 consumption to equal production. Industry said that its current reserves amount to about a five month supply.

•

APFC Honors Woodrum

An In Memoriam Resolution was adopted by the board of directors of the American Plant Food Council, Inc., December 6, 1950 in honor of the late Clifton A. Woodrum:

WHEREAS, the Honorable Clifton A. Woodrum served with distinction and honor as the first president of the American Plant Food Council, Incorporated, until his death October 6, 1950, and

WHEREAS, he established himself in the respect and affection of his State and Nation for his courage and effective championship of the principles upon which our private enterprise system is founded, and

WHEREAS, he rendered notable and effective service in creating a better understanding of the fertilizer industry, its contribution to agriculture and its relation to the National economy as a whole, and

WHEREAS, as an acknowledged leader in Congress for 23 years he was constructive, practical and farsighted in his approach to National affairs, always consistent with common sense in encouraging private initiative and discouraging regimentation, and

WHEREAS, by his character and devotion to duty, his courage of conviction, his integrity of purpose and his love of mankind, he established himself in the esteem of all who knew him and was singularly effective as a spokesman for business without being unmindful of the well-being of his fellow citizens, and

WHEREAS, his untimely death removes from Government and business a leader of influence for a better, stronger Nation, a friend with practical understanding of human weaknesses and appreciation for human fortitude,

THEREFORE BE IT RESOLVED, that the Board of Directors, in session this sixth day of December, Nineteen Hundred and Fifty, unanimously record their respect, appreciation and admiration for the late Clifton A. Woodrum, and recognize his effective leadership in the affairs of state and in the field of industry and particularly his manifold contributions in strengthening American business as the best safeguard of American democratic institutions, American initiative and American strength,

BE IT FURTHER RESOLVED, that a copy of this resolution be sent to the family of the deceased, that a copy be incorporated in the minutes of this meeting, that a copy be incorporated in the 1951 Journal of Proceedings of the American Plant Food Council and that a copy be sent to each of the fertilizer trade magazines.

•

ACS Meetings in April

April, 1951, will see meetings of the American Chemical Society in Boston (April 1-5) and Cleveland (April 8-12). The 119th National meeting will include sessions on "Methods of Analysis for Micro Quantities of Pesticides", under the pesticides subdivision, at Boston. Full details of the two programs will be announced later.

Headquarters for the ACS meeting in Boston are the Statler Hotel; at Cleveland, joint headquarters will be at hotels Cleveland and Statler.

•

Purcell Joins Pearson

John W. Purcell, formerly a vice-president of the Prentiss Drug & Chemical Co., New York, and for fifteen years associated with the sales department of Prentiss, has joined Pearson & Co., Mobile, Ala. as general sales manager. The new assignment was effective January 1. The Pearson company manufactures and distributes insecticides, fungicides, stock specialties and legume inoculants in the southern market. Mr. Purcell resigned from Prentiss a month ago.

Work Starts on New Fertilizer Plant in Texas

Ground was broken in Fort Worth, Texas, Dec. 13th, for a new chemical fertilizer and superphosphate plant which will be erected there by the Plant Food Division of International Minerals & Chemical Corp. Louis Ware, IM & C president, turns the first shovelful of dirt. To his left is George Thompson, president of the Fort Worth Chamber of Commerce, and to his right, Mayor F. E. Deen of Fort Worth. At extreme right is Maurice H. Lockwood, vice-president of International Minerals.

Big "Offensive" in Calif. Aimed at Leafhopper

The emergency control program to kill winter generations of beet leafhoppers, recently completed by the California Department of Agriculture, was launched on an almost unprecedented scale, it is reported by Dr. H. M. Armitage, Sacramento, chief of the State's department of entomology. The control measures, designated to protect more than 400,000 acres of susceptible crops with an annual value of more than a hundred million dollars, were aimed at destroying the insects before they were able to migrate to the foothills.

Infesting thousands of acres of range land on the western side of the San Joaquin Valley from Pacheco Pass in Merced county to Arvin, in Kern county, the insect pests are known to be carriers of curly top virus which damages many commercial crops in the area.

Dr. Armitage describes the physical job involved in getting the operation under way. As many as nine planes were in use at one time in applying the spray material at the rate of 1,000 gallons per hour, which amounted to 250 acres sprayed per hour, per plane. Some 29 flight strips were utilized, he said.

"We used a total of 184 tank loads of oil at these strips in carrying out the operations", he reports. "Trailers and semi-trailers were used as temporary roadside storage until ready for use."

Materials used in the big operation included ready-mixed DDT in diesel oil, using 37½ pounds of technical grade per 100 gallons, applied at the rate of four gallons per acre. (1½ pounds of DDT per acre . . . regarded as being harmless to animals which might feed on sprayed plants.)

Whether or not the big operation will prove successful will be known in the spring, when the extent of disease may be determined. However, Dr. Armitage observed that results of the campaign appear to be encouraging.

Top photo: "Field Generals" of operation: (L to R) Dr. Armitage; Hugh Wallace, in field charge of beet leafhopper operations; Robert Harper, application supervisor; and William Wiard, junior entomologist, supervisor of application crews on location.

Middle photo: Manner of handling and holding oil at flight strips. On hand in the picture are 12,000 gallons of insecticideal material. Contents of two of these units are required to keep single plane operating for one six-hour day. In all, 92 of these double units were delivered to flight strips.

Lower photo: State-operated ground equipment was used in some of the marginal areas in and around oil fields where airplanes could not be utilized with both safety and effectiveness.

Am. Cyanamid Pres. Dies

William Brown Bell, 71, president of American Cyanamid Co., New York, died of a heart attack December 20, while on a business trip in Morocco. He had headed the company since 1922. At that time, the company's chief product was fertilizer. He turned its attention to diversified fields and acquired many smaller companies.

Born at Stroudsburg, Pa., he attended local schools and received his A. B. degree in 1900, from Haverford College in Pennsylvania. In 1901, he received an A. M. in political science from Columbia and in 1903 was graduated as an attorney.

Succeeding Mr. Bell is Raymond C. Gaugler, who has been with Cyanamid since 1917. Starting then as an accountant, he progressed through the positions of assistant treasurer and comptroller, and became treasurer in 1929. In 1939, Mr. Gaugler was made vice-president in charge of finances where he remained until his latest promotion.

Replacing Mr. Bell on the board of directors, is T. L. Perkins, of Perkins, Daniels and Perkins, New York.

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To Chem. Construction Co.

Brigadier General Edward Montgomery, U. S. Army, Retired, has been appointed Assistant to the Executive Vice President of the Chemical Construction Corporation, 488 Madison Avenue, New York.

Recommendations in Calif.

Recommendations bearing on technical and legal questions pertaining to the application of pest control materials, were drawn up at the annual meeting of the Agricultural Pest Control Association, Inc. of California, held at Fresno, California, on December 9.

Questions discussed included that of public liability, both of the employing farmer and the pest control operator making the application. The draft of resolutions as furnished by Dr. E. R. de Ong, consulting entomologist and executive secretary of the association and President E. O. Carson follows:

Resolutions

1. The Agricultural Pest Control Association, Inc. of California recommends as follows: that the California State College of Agriculture, the California State Department of Agriculture, the manufacturers of pest control materials and application equipment and other sources of pertinent information shall furnish copies of all publications and use and application of pest control materials, to all State licensed agricultural pest control operators.

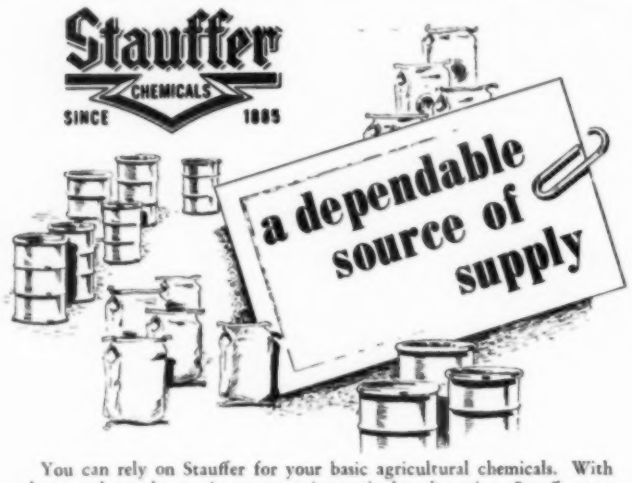
2. The Association urges the development of co-operative experiments between its members and the State Experiment Station, the State Department of Agriculture, manufacturers and other interested parties, in all matters pertaining to the use and application of hazardous pest control materials.

3. The Association recommends the study and establishment of a legal statute of limitation for the filing of claims of damage to any orchard, vineyard, crop or living plant from application of pest control materials. All such claims for damage shall be filed within 60 days of the date of application of the pest control material causing the alleged damage and before ten percent of the treated crop shall have been harvested.

4. The Association recommends that the members shall cooperate with the underwriters of insurance covering the application of pest control materials, in promoting a better understanding of the problems and in establishing recognized standards of equipment and application methods.

5. The Association wishes to express its appreciation of the pest control operators conference held on the University of California Campus, Davis, during February, 1950. It recommends the holding of a similar pest control operator conference on the Davis Campus in 1951 and that a duplicate operators conference be held at the University of California Campus, Riverside. A conference in Southern California would make possible the discussion of area problems and give opportunity of larger attendance.

It is further recommended that additional provision be made for instruction in plant pathology in addition to economic entomology and insect control.



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Spraying—Dusting—Soil
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Emulsifiable Concentrates and Mixed Dusts

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LINDANE
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ALDRIN
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PARATHION
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Pennsalt Names Roeller

Pennsylvania Salt Mfg. Co. Philadelphia has placed its six sales departments under the supervision of two assistant general sales managers, it was announced today by William P. Drake, vice-president and general sales manager.

Appointed to these newly created positions are R. S. Roeller, who will have general supervision of the Agricultural Chemicals, Heavy Chemicals and Special Chemicals Departments, and Arthur G. Tunstall, Jr., who will supervise the B-K and Household Products, Laundry and Dry Cleaning and Maintenance Chemicals Departments.

Mr. Roeller was sales manager of the Heavy Chemicals Department and will continue to act in this capacity. He joined Pennsalt in 1922 as a salesman in the Heavy Chemicals Department and since that time has served in various capacities in that department, including that of district sales manager of the Philadelphia area and field sales manager.

•

Spencer Names Cantwell

Spencer Chemical Co., Kansas City, announced recently the appointment of Dallas Cantwell as agronomist, of its Southeastern District. He will be stationed in Spencer's district sales offices, in Atlanta, Ga. Prior to his appointment by Spencer, Cantwell served for two years as Associate County Agent for Sedgewick County, Kansas.

•

Foringer with Lion Oil

T. M. Martin, president, of Lion Oil Company, El Dorado, Arkansas, has announced that John W. B. Foringer has joined the company as Director of Industrial Relations. He will have charge of all matters relating to personnel and labor relations.

•

Sanders Joins Spencer

M. Kirk Sanders has joined Spencer Chemical Company, Kansas City as agricultural chemicals sales representative in Florida. Mr. Sanders, a graduate of North Carolina State College, has had 20 years' experience in the chemical field.

Kansas Fertilizer Conference Held

MEMBERS of the fertilizer industry doing business in Kansas were guests of the Department of Agronomy of Kansas State College, December 7 and 8. Dr. H. E. Myers and his capable staff reviewed current research dealing with fertilizers. Their latest findings on experiments with wheat, corn or sorghum, alfalfa and red clover were emphasized particularly. On the basis of their research, the following recommendations were made (All per acre basis):

Wheat, drill 150-200 pounds of 0-20-0 or 65-90 pounds 0-45-0 with the seed plus 60-120 pounds of ammonium nitrate or equivalent either at planting or as a top dressing anytime until March 15.

Corn or Sorghum, put down at planting 100-150 pounds of 0-20-0 or 40-60 pounds of 0-45-0 plus 100-200 pounds of ammonium nitrate or its equivalent at time of planting or as a side dressing at first or second cultivation. If the soil is deficient in potash, use 0-20-20 or 0-14-7 instead of 0-20-0 or 0-45-0.

Alfalfa—On land high in potash, drill or broadcast, just prior to seeding, 200 pounds 0-20-0 or 90 pounds 0-45-0. On land low in potash, use 285 pounds of 0-14-7

Red Clover, drill with the small grain seeding 200 pounds of 0-20-0 or 90 pounds of 0-45-0 where phosphorus alone is needed, or use 200 pounds of 0-20-20 or 0-20-10 or 285 pounds of 0-14-7 where both phosphorus and potash are needed.

M. H. McVickar, chief agronomist, National Fertilizer Association, Washington, discussed the use of aircraft in applying fertilizer, pointing out that the airplane could sometimes be used to advantage in putting down fertilizer at the proper time when weather conditions make it impossible to do the job with ground equipment.

At the banquet, the guest speaker, Kenneth A. Spencer, president of Spencer Chemical Company, described how nitrogen producers take coal or natural gas and produce valuable agricultural nitrogen. With expensive equipment and complicated processes, a final product is manufactured having a value many times that of the initial raw materials. Mr. Spencer went further and stressed that under efficient plant management and judicious agricultural use nitrogen benefits our whole economy —the producer, the farmer, those employed in the plant, those engaged in transportation and, of course, the public by providing more and better food at lower prices.

In summarizing the conference, Dr. Myers stressed the wisdom of increasing production through judicious fertilization rather than purchasing more land. He pointed out that the price of fertilizer was relatively low compared to the prices received by farmers for their products.

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Ill. Custom School Jan. 18

Dates for the Illinois Custom Spray Operators' Training School have been set for January 18-20, according to H. B. Petty, extension specialist in entomology, University of Illinois, Urbana. The meeting, to be held in the Illini Union Ball Room on the University campus, will place particular emphasis on insect and weed identification, insecticides, formulations, mode of action, toxicity and residues, Mr. Petty said. Discussions will also be held on recent developments and recommendations on the control of corn borer, grasshopper, and chinch bug, as well as information on new application equipment. A session on new developments in brush control, weed control and soybean defoliation is also expected to be held.

•

Davison Names Roop V-P

Davison Chemical Corp., Baltimore, Md., has named Marshall C. Roop as vice-president-finance. Mr. Roop was both secretary and treasurer of Davison, and will retain the former office. The new treasurer will be J. Early Hardesty.

Plant Food Council Elects Truitt President

PAUL T. Truitt, president of the National Association of Margarine Manufacturers since 1943, has just been elected president of the American Plant Food Council, Inc. He succeeds the late Clifton A. Woodrum, who died October 6th. Mr. Truitt's work with the margarine manufacturers group was exceptionally successful, and in 1949 the association, under his leadership, was given the Public Relations News Annual Achievement Award for excellence in public relations programs.

"As president of the council," Mr. Truitt said, "I shall endeavor to further the organization's aims and purposes, with special emphasis on the all-important problem of maintaining, replenishing and increasing the fertility of our soil."

"We feel fortunate," said W. T. Wright, of Norfolk, Va., chairman of the executive committee of the Plant Food Council, "in obtaining the services of an outstanding man like Mr. Truitt. Wherever he has worked he has built an enviable reputation for integrity, industry, ability and achievement. I know Mr. Truitt is looking forward with zest to helping the membership of the American Plant Food Council aid agriculture. Our job is to help improve the land and to raise better crops. Both are in the public interest, and each is part of our first line of national defense."

PAUL T. TRUITT

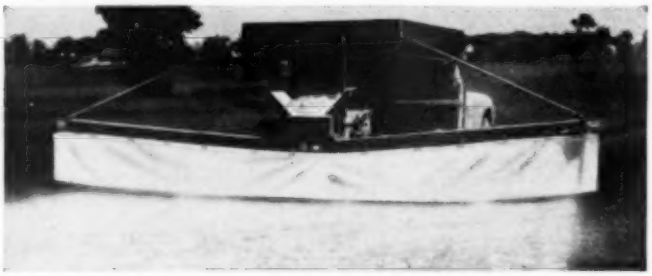
Mr. Truitt was born in Millersburg, Mo., on October 25, 1900. He was graduated in 1924 from the University of Missouri where he studied agriculture and business administration. He married Jonnabelle Hunt of Kansas City, Mo., in 1928.

Previous to his position as president of the National Association of Margarine Manufacturers, he had been an executive with Sears-Roebuck & Co., and had been an official of the Treasury Department and the Department of Commerce.

•

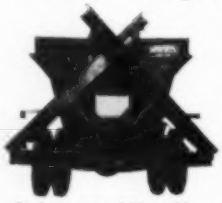
New Fertilizer Plant

Fannin's Gas and Equipment Co., Glendale, Ariz., recently launched a new $350,000 fertilizer plant, in Glendale, which will handle bulk storage of anhydrous ammonia and a low-cost, concentrated source of nitrogen. In explaining the decision to enter the fertilizer field, Ernest Fannin, president of the company,



Why is Hercules the ONLY spreader that gives uniform distribution?

If you *throw* a handful of fertilizer into a field, the heavy bits naturally go farther than the fine powders—you get *uneven* distribution. You can see for yourself why any "spreader" that *throws* lime and fertilizer *is bound to give uneven distribution.* That's why Hercules uses an entirely different principle to build a spreader that actually *spreads* fertilizer, instead of throwing it. With this exclusive Hercules principle, chain conveyors pull the material across a diagonally-cut distributor plate, so that it drops uniformly at all times.



Discharge arms fold quickly and easily for highway travel.

What's the result? Better crops. More profits. No more soil burn. No spotty concentration of materials. No waste distribution. Lime and fertilizer spread evenly, no matter what the weather, in 20-foot swaths. Gives accurate quantity control from 200 lbs. to 8000 lbs. per acre. Spreads all types of agricultural limes and fertilizers, dry or moist.

Get Hercules— *the only spreader that SPREADS fertilizer instead of throwing it!*

HERCULES STEEL PRODUCTS CORPORATION
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Please send me—

☐ More information on the revolutionary new Hercules Spreader.

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pointed out that the company has distributed millions of gallons of liquid petroleum gas to rural areas since 1929, and that anhydrous ammonia is handled much like liquid petroleum and can be transported by Fannin's fleet of 86 special trucks and other vehicles.

•

Mente Shifts Executives

Announcement has been made by Mente & Co., Inc., textile bag manufacturers in New Orleans, of the following promotions and realignment of executive duties, effective immediately: Marshall L. Harper, formerly assistant secretary-treasurer, has become assistant vice-president; J. Lucius McGehee is now assistant vice-president in charge of research and development; while E. Reid Powell, plant manager, assumes in addition the title of assistant vice-president in charge of production. In Mente's Savannah branch, James A. Baggs, Jr. has been made assistant manager, and the same title has been given to M. P. Robertson at the Houston branch.

•

Canadian Report Issued

The annual report of the Canadian Department of Agriculture has been issued by James G. Gardiner, minister of Agriculture for the Dominion. The 288-page book describes in detail the year's activities in control of insects, plant disease and weeds, as well as a section on the use of fertilizers. It is available from the Canadian Dept. of Agriculture, Ottawa, Ontario, for 50¢.

•

Canners to Meet in Chicago

The National Canners Association will hold its 1951 convention at the Stevens Hotel, Chicago, February 14-23. The group will study the impact of wartime economy on the industry, and it was expected that discussions will be conducted covering the use of chemicals in the raising of foodstuffs. An exhibit of machinery and supplies will be included in the general program, according to Nelson H. Budd, director of the NCA information division.

AAEE MEETING

(*Continued from Page 53*)

applied in toxicity studies; and determining other sources by which consumers may be affected by the same substances. He pointed out that the FDA has at its call scientists of its own, and also workers of U. S. Public Health Service which includes the National Institutes of Health. Both Public Health and the FDA are divisions of the Federal Security Agency, and both will participate.

(An unfortunate accident marred Mr. Levinson's talk. Upon its completion, he stepped backward and fell from the raised platform, injuring his back. He was taken to a Denver hospital where treatment was given, and he was later brought back to Washington by plane. Latest reports were that he was recovering satisfactorily.)

Frank Pricini, M.D., of the

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Triangle Brand Copper Sulphate is dependable . . . safe and costs less. Yet, by actual field test, it gives greater yields! That's why growers actually use more Triangle Brand Copper products on their crops than any similar plant protection material. Don't be satisfied with "substitutes." Get the best—always demand Triangle Brand.
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Valuable booklets: "Bordeaux Mixture," "Bordeaux Controls Late Blight on Tomatoes," "Better Potato Yields," "Basic Copper Sulphate."
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Kettering Laboratories, Cincinnati, Ohio, spoke on the environmental health aspects of certain agricultural pesticides, pointing out in detail that some of the fears regarding harmful effects to man are overemphasized. This paper in full is to appear in the February issue of *Agricultural Chemicals.*)

Albert Hartzell of Boyce Thompson Institute for Plant Research, Yonkers, N. Y., in his paper "Bioassay of Organic Insecticides in Processed Foods" compared the advantages and disadvantages of chemical and bioassay methods for the detection of toxic insecticidal residues in processed foods. Chemical methods are usually more accurate and specific than bioassay methods, he pointed out, but on the other hand, biological methods of analysis are usually more sensitive. Better methods are urgently needed, he emphasized, for the detection of organic spray residues in processed foods.

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T. P. S. Teotia and Paul A. Dahm of the Kansas Agricultural Experiment Station, in their paper, "The Effect of Temperature, Humidity and Weathering on the Residual Toxicities of Five Organic Insecticides to the House Fly," presented data on comparative evaluations of the residual effectiveness of five organics, aldrin, chlordane, dieldrin, lindane and parathion. Emulsions of the five insecticides were compared on the basis of 50 milligrams of toxicant per square foot applied to unpainted, painted and whitewashed plywood panels and exposed to the elements for 45 days. The dieldrin formulations were the most persistent on all three types of panels, maintaining 50% of their initial toxicity on the 45th day. Then followed in order of persistence aldrin, parathion, chlordane and lindane. In applications on glass panels, dieldrin and parathion were the most persistent.

Robert Glen, Chief, Division of Entomology, Canadian Department of Agriculture, reported on "Some Recent Developments in Canadian Entomology." Research in the division has more than doubled over the past five years, he stated. Mr. Glen emphasized that Canada has established effective measures for the registration of insecticides prior to sale "with a minimum of legislation."

W. L. Popham, B.E.P.Q., U.S.D.A., reviewed "Some of the Fundamental Problems Characteristic of Large Scale Pest Control Projects." The new approach to pest control problems, he said, is in the direction of "preventive entomology." This approach he contrasted with the temporary, stop-gap, "sandbagging-the-levee" type control which has often had to be resorted to in the past to meet immediate serious insect infestations. To prevent widespread and destructive outbreaks of crop, forest and livestock pests, from occurring periodically, he counseled, there must be foresight, intelligent planning, scientific and constructive preparation before the insect infestations actually appear.

"For some fifty years," he observed, "gypsy moth control was a fine illustration of sandbag control."

In spite of all such efforts, the pest was steadily spreading. Fortunately new control methods have become available and there seems now to be a strong possibility that the gypsy moth can be eliminated entirely. Until recently, he added, "grasshoppers and Mormon crickets were also fought on the sandbag basis." Farmers were accustomed to accepting periodic invasions as inevitable. However, within the past five years control procedures have progressed so rapidly that many entomologists "are optimistic that these most destructive of all crop pests associated with western agriculture may be successfully combated on a preventive basis."

Such a result can be achieved, the speaker emphasized, however, only as a result of constructive thinking and planning in advance of the infestations.

"There is urgent need," he pointed out, "for greater flexibility in the use of personnel and facilities in our research programs." The productiveness and effectiveness of organized and publicly supported pest control work could be substantially increased, he argued, by having:

(1) An organization and facilities which would permit an alert and aggressive research program without the usual delays.

(2) An adequately staffed, trained and flexible foreign plant quarantine service.

(3) A joint Federal-State survey organization of highly trained, alert and practical technicians directing its efforts toward sound preventive programs of pest control.

(4) More adequate pilot plant testing of suggested new pest control procedures.

Probably the most important development at the business sessions was a decision to refer to the membership a proposal to merge the two national entomological organizations (the A.A.E.E. and the E.S.A.) into one. The proposed combined organization would have a full-time Executive Secretary, and a Governing Board larger than either of the present Executive Committees, which would conduct most of the business of the new organization. The Board as proposed will be as representative as possible of the various interests in the profession, both geographically and as to subject matter.

Special committees have been working on this proposal for two years and their recommendations are embodied in a proposed amendment to the constitution that will be submitted to the membership for mail vote. If two-thirds of the votes cast by members of each organization are in favor of the plan it will go into effect as soon as practicable after January 1, 1952.

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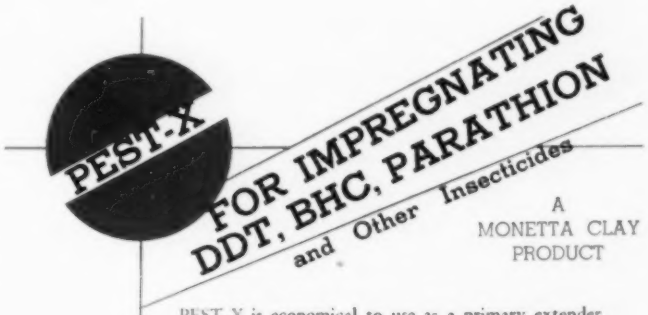
Southern PCO's Meet

The eleventh annual southern Pest Control Operators' conference is to be held on the campus of Louisiana State University, Baton Rouge, January 29-31. The program will include a talk by Wm. O. Buettner,



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PEST-X has been developed from a deposit containing no grit, (free silica), and no other abrasive particles which must be separated out by air flotation, thus permitting a heavy enough bulk density for incorporating poisons in crystalline form by grinding at higher speeds.

PEST-X has small particle size, 15% being less than .5 microns and 70% less than 15 microns.

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PEST-X has a pH value of 4.48 and produces a stable final product, showing no deterioration in toxicity of the insecticide.

PEST-X is recommended for wettable concentrates. PEST-X is desirable when the toxins are to be incorporated by impregnation.

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National Pest Control Ass'n. secretary, Brooklyn, N. Y., on safe use of chemicals and formulations; and sessions on fly and rat control.

FUNGICIDES

(*Continued from Page 63*)

while untreated areas remain chlorotic and stunted. It was noted that the response did not affect the new growth formed after the plants were sprayed; the iron is not readily translocated, a fact that has been noted by others working with different crops. For this reason repeated sprays are necessary.

Some applications have been made with a fixed-boom sprayer with two nozzles per row, others with conventional power sprayers with hand hoses. Better results are being obtained in San Mateo County with hand applications, probably as the result of better wetting and coverage. Application rates have averaged 100 to 150 gallons per acre.

According to these workers, this is one of the few examples of satisfactory response to ferrous sulfate sprays for control of chlorosis on a commercial scale. They report that other crops in the same region, on the same soils, do not show chlorosis. These crops include stock, gladiolus, marguerite daisies, strawflowers, and brussels sprouts.

Effect of Fungicidal Drenches

FRANK A. Haas and D. E. Ellis of the North Carolina Agricultural Experiment Station report that lettuce downy mildew, caused by the fungus *Bremia lactucae*, resulted in serious loss of plants in isolated propagation frames in the vicinity of Burgaw and St. Helena, North Carolina, during January, 1950.

In the fall of 1949 an experiment was performed on a lettuce farm near Burgaw to determine the efficacy of two soil fumigants and three fungicides applied as drenches, in controlling damping-off of lettuce seedlings. Damping-off was of little consequence in this test, but downy mildew appeared in epidemic form between January 10 and 27.

On January 17 an estimate was made of the amount of infection in the various treated plots. It was found that plants treated with certain materials were free or relatively free, whereas others were heavily infected. On January 27, 10 plants taken at random from 5 stations in each of the 3 replicates planted with Iceberg lettuce and Romaine lettuce were examined for downy mildew. The results of the examination are given in Table 1, together with pertinent data relative to materials and methods employed, quantities applied, and application schedule. The disease index used in the Table is statistically derived from infection readings in percent.

Infection readings were high for the control plots and the fumigated plots. In marked contrast, however, plots that received drench applications of "Fermate" or "Tersan" contained but few infected plants,

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Check the specifications on the new Pestmaster 75% Wettable Powder. Compare them with the highest manufacturing standards obtainable and you will see for yourself why we are justifiably proud of the high quality and uniformity of Pestmaster Agricultural Chemicals. Whatever your insecticide problem may be, Agricultural, Industrial or Public Health, try Pestmaster for best results.

DESCRIPTION:
A uniform, light-colored, free-flowing powder. Air-milled for fine particle size and compounded with surface-active agents for quick wetting and uniform dispersion in water. Highest suspensibility even in hard-est waters. Specially suited for concentrate sprays. Leaves minimum of visible residue.
SPECIFICATIONS:
DDT (dichlorodiphenyltrichloroethane) not less than 75.0%. • Average particle size, maximum, 4.6 microns. • Screen test (wet): Passing 325 mesh, minimum, 99.5%.
USES:
As a spray for control of insect pests of: farm crops • barns, stables • fruit • mills • granaries • vegetables • canneries • turf • packing plants • livestock • industrial plants • municipal and public buildings.
SHIPPING REGULATIONS: None
RAILROAD CLASSIFICATION: Insecticides, agricultural
STANDARD CONTAINERS:
Bags, paper — Lbs. Net 50 — Lbs. Gross 51
Drums, fibre — 135 — 143
MICHIGAN CHEMICAL CORPORATION, SAINT LOUIS, MICHIGAN
Manufacturers of
ORGANIC AND INORGANIC BROMIDES, SALT, MAGNESIUM OXIDES, LIQUID CALCIUM, MAGNESIUM CHLORIDE, DDT AND OTHER PHARMACEUTICAL, INDUSTRIAL AND AGRICULTURAL CHEMICALS

and plots that received drenches of "Dithane Z-78" were free of infection.

The first drench treatments were applied on November 28, 1949, at the time of seeding, and were continued at weekly intervals until January 9, 1950; hence a total of 7 applications were made. Each drenched plot received approximately 4.5 grams of fungicide per square yard of soil surface per application, and a total of approximately 31.5 grams per square yard for the season.

The interval lapse between the final drench application and final recording of data amounted to 18 days, and during this interval the lettuce plants made more than a one-fold growth increase, thus reducing the possibility that downy mildew accrued from a protective coating of the fungicides as a result of direct drench application to the plants themselves. Theoretically, therefore, complete downy mildew control with "Dithane Z-78," and near-complete control with either "Fermate" or "Tersau," achieved in this experiment, may have resulted, on the one hand, from volatilization of the fungicides from the soil surface and condensation on the leaves, or, on the other hand, from plant absorption, either through roots, cuticle, or stomata, of the compounds directly or of some fungicidal fraction of these compounds, thus imparting a therapeutic effect. Explanation of the factual results will require further information.

FOREIGN VISIT

(*Continued from Page 55*)

at Hammerby. We also visited institutions in the environs of Stockholm, namely, the Natural History Museum, the Bergius Botanic Garden, the Swedish Protection Institute, and the Forest Research Institute. These experiences deepened our awareness of the high place Sweden holds in the entire field of Botany and botanical research.

We left this land of Viking splendor with regrets, compensated only by the desire of returning again to enjoy the friendliness of the Swedish people, the cleanliness of Stockholm, and the beauty of the whole Scandinavian countryside.

Our first stop after Sweden was Copenhagen where we visited the Carlsberg Research Institute and saw some of the physio-chemical work being conducted on proteins and amino acids. After a quick flight from Copenhagen to Scotland, we next visited the Department of Agriculture for Scotland at Corstorphine near Edinburgh. Here are made the Scottish studies on virus diseases and their transmission; the work being done on identification of virulent strains of late blight of potato (*Phytophthora infestants*); the work of Miss Noble on seed-borne parasites, and that of Dr. Boyd on orographic rain problems as related to late blight of potato.

There was much to see and enjoy in Edinburgh, in its environs famed in the stories of Robert Louis Stevenson. We also enjoyed a visit

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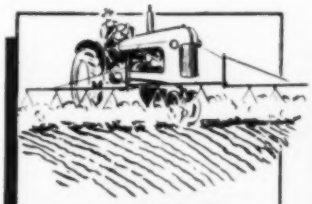
Hand testing of every **Sprajet** Nozzle with a chemical solution is undertaken at our factory to predetermine proper spraying patterns under simulated field conditions. The thoroughness of this test enables us to UNCONDITIONALLY GUARANTEE **Sprajet** Nozzles for one full spraying season and assure users of efficient, trouble-free operation.

THERE IS A Sprajet NOZZLE FOR EVERY JOB

The full-size range of **Sprajet** tips, both flat fan and cone, assures users of a proper selection whether the job calls for spraying crops, pasture, live stock, brush or buldings. Today, **Sprajet's** complete line is filling the needs of the country's expanding spraying program.



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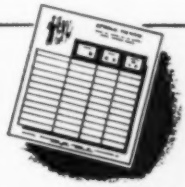

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For information on the chemical solution application per acre using SPRAJET nozzles at different speeds, pressures and row plantings, write for your free copy of our handy pocket-size Flo-Guide today.

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to the Seaweed Research Institute at Musselburgh, seeing its work and more of the countryside through the hospitality of Dr. F. N. Woodward, director. Finally, after a visit with Prof. and Mrs. Matthews of Aberdeen University, we "went up" to London.

In the heart of this tremendous city and outlying areas, we were fortunate enough to see some of the problems being studied at a few of the English research stations, particularly the work at the Commonwealth Mycological Institute, Kew; Rothamsted Experimental Station, and the East Malling Research Station, Kent; also at the Commonwealth Potato Research Station, Cambridge. At the Commonwealth Mycological Institute, we had an opportunity to meet the director, Dr. S. P. Wiltshire, and several members of his staff. Although we missed seeing Kew in lilac time, we did enjoy the magnificent gardens and greenhouses of the Botanic Gardens, which were none the less beautiful.

At Rothamsted Experimental Station, Harpenden, we met and discussed with Dr. Philip Gregory, his work on the physics of spore dispersal under both laboratory and field conditions.

The Continent was the object of our next journey and we succeeded in visiting several botanic gardens and research institutes in France, Italy, southern Germany, and, principally, the Netherlands. At Wageningen, Holland, we visited the Laboratory of Phytopathology, and in another branch, the Phytopathological Service Laboratory for Holland. Here we learned of the work being done on the identification of fungi, the solution of nematode problems, and the micro-meteorological research conducted by Dr. Post at de Bilt on the relation of weather to plant diseases.

At still another research institution in Holland, the "Willie Commelin Scholten" Phytopathological Laboratory at Baarn, we had the pleasure of meeting Dr. Johanna Westerdyck, head of the institute, and world-renowned mycologist. At her Institute we saw some of the research under way and also the world-famous collection of fungi it maintains.

Aside from the time employed in professional visiting, we were gratified to see some of the centers of learning of a non-botanical nature—museums, art galleries, the spiritual shrines and edifices renowned in centuries-old history, quaint and fortressed towns, the resting places of kings, poets, authors, and the scenes of their activities. We saw the sites of ancient and modern war, and pondered on how little mankind seems to learn from the peaceful quiet of the shores of Hannibal's Lake Trasimene and the hollow wastes of London's bombed squares in back of St. Paul's.

Though slightly travel-worn upon returning to America, the fatigue was as nothing compared to the richness of this experience in meeting our European confreres, in the discussion of botanical interests!

FROM ABOUT 1930
... Plant Pathologists and Biochemists have proclaimed the superiority of organo-metallic fungicides. Superiority of these compounds determined by better absorption and penetration, reduced residual toxicity, absence of plant injury, higher value per unit of metal, perfect distribution throughout emulsion. Further superiority in no clogging, no cleaning, no mechanical stirring, no separation.
Organo-metallics may be sprayed throughout the whole season of growth, and can be combined with insecticides into a single spray.
... now, twenty years later —
HLW EMULGATES as
ORGANO - METALLIC FUNGICIDES
(SPRAY CONCENTRATES)
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ORCUPRON the modern challenge to COPPER SULFATE. A 20% Copper Resinate dissolved in blended oils, for continuous copper spray. Average emulsion spray at the rate of 2%. Low priced.
MERCUPRON combining aromatic copper and mercury compounds, a wide range fungicide spray concentrate (downy mildew, blights, rot, many parasites). Low residual toxicity.
MERCUSOL a modern seed protectant, an Emulgate of 2% organic mercury in blended solvents, for use as an emulsion, at the rate of 1:2000 or more.
ALNUTRON the Universal Soil Nutrient, Emulgate of Boron * Cobalt * Copper * Iron * Manganese * (Molybdenum) * Zinc in blended Solvents, totaling the elementary trace elements.
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New Plant for Spencer

Spencer Chemical Company began production of fertilizer and industrial ammonia last month at its Henderson Works, Henderson, Ky. The Henderson plant was purchased from the government earlier this year. At the same time, Spencer leased nitric acid facilities at Charlestown, Indiana. The Charlestown Works are to be used to manufacture "Spensol" (ammoniating solutions) for mixed fertilizers. Operations at the Charlestown Works were expected to begin early in December.

•

Roberts to L.A. for Bemis

George N. Roberts, Jr., formerly in the accounting and auditing department of Bemis Bro. Bag Co. general offices in St. Louis, has been appointed office manager of the Bemis plant and sales division in Los Angeles, the company has announced. The appointment became effective December 4.

TESTIMONY

(*Continued from Page 59*)

soil, he testified that adequate liming and fertilizing with chemical fertilizers in Wisconsin are increasing yields generally from 20 to over 100 percent. "With such treatment," he said, yields per acre of alfalfa hay of four tons, oats and corn of 100 bushels and potatoes of from six to eight hundred bushels are becoming common. It is probably safe to say that if the farmers of Wisconsin had never used any lime or chemical fertilizer, their yields on the average of the common farm crops would not be greater than one-half of what they are today." He went further to say that an increase of lime and chemical fertilizer use in his state would increase yields another 25 to 50 percent.

Public Health Impaired?

SCORNING the idea that public health may be undermined by the use of chemical fertilizers, Dr. Truog presented strong scientific evidence that such fears are completely groundless. "Let us examine carefully some of the arguments propounded by the 'organic school.", Dr. Troug proposed. "First, what about the contention that food produced through the use of chemical fertilizers is inferior in quality because of such use? This claim is founded largely on imagination and has never been substantiated by careful observation or rigorous experiments. If such food is too low in some element like phosphorus, it simply means that an improper grade or amount of fertilizer was used, all of which can be corrected by well-established procedures. The claim that food produced through the use of chemical fertilizers contains because of such use substances inimical to health has also never been substantiated, nor does there exist any authentic evidence to support this claim.

It is true that should a chemical fertilizer contain notable amounts of an element like selenium which is not essential for plant life and is

The new Picco hi-solv solvent oils

★ EXCELLENT SOLVENCY for Insecticide Chemicals

★ ATTRACTIVE PRICES reduce your production costs

Picco HI-SOLV Solvent Oils include several grades ideally suited for use with DDT, 2-4-D esters, benzene hexachloride, parathion, and other insecticides. The series of Picco Hi-Solv solvents and solvent oils consists of a number of grades. A typical analysis of one is given below.

We will be glad to work with you in selecting the proper grade for your specific applications:

Typical Analysis Hi-Solv 473	
Distillation Range	400° F—520° F
Specific Gravity	0.900—0.915
Color	light straw
Flash Point	180° F

Write for complete data and sample

PENNSYLVANIA INDUSTRIAL CHEMICAL CORPORATION
CLAIRTON, PENNSYLVANIA
Plants at Clairton, Pa.; West Elizabeth, Pa. and Chester, Pa.

Pennsylvania Industrial Chemical Corp.
Clairton, Pennsylvania
Please send me a free sample of HI-SOLV. I wish to investigate HI-SOLV for use with

Name.....
Company.....
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very toxic to animal life, then food produced through the use of this fertilizer might contain dangerous amounts of selenium. Selenium poisoning of livestock which had pastured on land naturally high in content of selenium is well known. Plants have a habit of taking up notable amounts of any soluble substance that exists in solids whether they need it or not for growth. Use of food as nature produces it on soils not treated with chemical fertilizers is obviously no guarantee of either good food or good health. Scientists connected with the U. S. Department of Agriculture, State Agricultural Experiment Stations, and fertilizer manufacturers are continually on the lookout for extraneous substances in fertilizers which on introduction into soils might injure the soils or produce food having toxic properties. Should the presence of such substances be detected in dangerous amounts, there is no question but what the condition will be promptly corrected through appropriate means."

J. I. Rodale, Emmaus, Pa., editor of *Organic Gardening* magazine, told the Committee that all chemical fertilizers are dangerous to crops and humans and should be gradually set aside in favor of organic, or "natural" fertilizers. He declared that instead of chemical fertilizers, agriculturists should use leather dust, corn cobs, ground rocks, bone meal, dried blood, leaves, weeds and various other natural products.

He suggested that the large numbers of draft deferments "are the result of the food we're eating", and blamed chemical fertilizers for lowering health standards. For people to have to eat plants sprayed with poisonous insecticides is a "downright crime", the witness added.

■

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Furnished as a granular powder in concentrated form, DPM offers these advantages over liquid mercury complexes:

FASTER-ACTING...MORE LASTING EFFECT...EASIER TO USE

EASIER TO HANDLE AND SHIP... GREATER UTILITY

SUGGESTED USES:

*** Crabgrass Control**

1. Apply as a solution with watering can. (Two applications give completecontrol).
   or
2. Apply with sprayer.
   or
3. Mix with diluent such as sand, vermiculite, etc. and apply dry.
   or
4. Mix with certain fertilizers and apply in Spring to PREVENT CRABGRASS EMERGENCE.

*** Apple Scab Control**

1. In powder form easy to package.
2. Cannot freeze.
3. Stable indefinitely.
4. Inexpensive.
5. 1950 field tests proved DPM equal to any mercury formulation.

*** Seed Disinfectant**

1. Use as a powder.
2. Use as a solution.
3. Use as a slurry.

*** Agricultural Weed Control**

1. Mix with 2,4-D. Excellent control of weeds and crabgrass in gladiolus and certain other bulb crops.
2. Apply as pre-emergence treatment for weed-row crop control for many crops. Neutralize 2,4-D residue with activated carbon. Synergistic action of mixture requires less 2,4-D, thus neutralizer is reduced to under 10 lbs. per acre on 3 ft. row crops, band treated.

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Details and Samples on Request
(Specify type of test for which you require samples)

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TECHNICAL BRIEFS

(*Continued from Page 69*)

at concentrations above the effective dosage range. It is of interest to note that this product does not inhibit or kill *Aztobacter agile*, one of the root-nodule bacteria.

Results of field trials against foliage diseases of ornamentals indicate effective dosage rates of 2 quarts per 100 gallons or 3 pints plus one pound of zinc sulfate per 100 gallons.

Other potential fields of application are as a turf fungicide and a soil drench. There has been increasing interest by plant pathologists in soil-borne diseases of plants. "Vancide 51" is toxic to certain pathogenic soil organisms but is not toxic to plants grown in the treated soil.

As a systemic fungicide or chemotherapeutant, "Vancide 51" is of interest because it is an effective fungicide, it is not toxic to the plants, and it neutralizes the toxins produced by the fungi, according to the makers.

Literature and samples are available on request. Write to Vancide Dept., R. T. Vanderbilt Co., Inc., 230 Park Avenue, New York 17, New York.

N. J. Mosquito Meeting

The 38th annual meeting of the New Jersey Mosquito Extermination Association will be held at Hotel Haddon Hall, Atlantic City, Feb. 28, March 1 and 2.

•

PASTURES

(*Continued from Page 30*)

invested in fertilizer will bring back from $5 to $9 according to the type of grazing crop involved. No one would attempt to grow anything without feeding it properly, and so it is with pasture crops.

There is nothing as valuable to the future prosperity of our nation as the wise use of fertilizer on all crops, especially on pasture crops. Grazing crops need and must have lime, phosphate, potash and nitrogen. Some soils are not short of just one of these plant nutrients, but most of them are short of *all* major elements.

Soil testing is an outstanding method of finding out the largest amount of fertilizer the different grazing crops can use and still show profit. Obviously, if a farmer uses too small an amount of fertilizer, his grazing crop will be poor. On the other hand, if he uses too much, the expense will be unnecessarily high. Soil testing tells how much to use to make a profit each year from all the plant food used. It's just taking the gamble out, if high fertilizer rates are used.

Pastures will do four things for America:

1. Pastures save the soil from erosion.
2. Pastures make the soil rich.
3. Pastures grow grass and clover to keep the soil covered.
4. Pastures make money to keep people on the soil.

But America will have to do four things for pastures:

1. Evolve a long-time pasture program.
2. Use enough plant food to get results.
3. Put in the right seed in correct combinations.
4. Manage the grasses and clovers after they get on the pastures.

All businesses in America are built according to blue prints and are managed by an over all plan. The pasture plan is the blue print by which to build pastures: By carefully following a plan, many crops can be planted together and many can be planted following another crop all during one growing season. So far, no one has failed on a good pasture program where a good plan was followed.

Most Americans carry insurance and the best pasture insurance is the wise use of fertilizer. It would be foolish to plan a pasture and leave off the fuel that makes it go; like buying a car and neglecting to buy gasoline.

One of the major practices that the farmers of America must learn to follow is re-application of fertilizer for maintenance each year. Too many people who start pastures have good ones in the beginning and then allow them to decline into poor ones. The major cause of this is that they fail to look after the plant food needs of the pasture crops.

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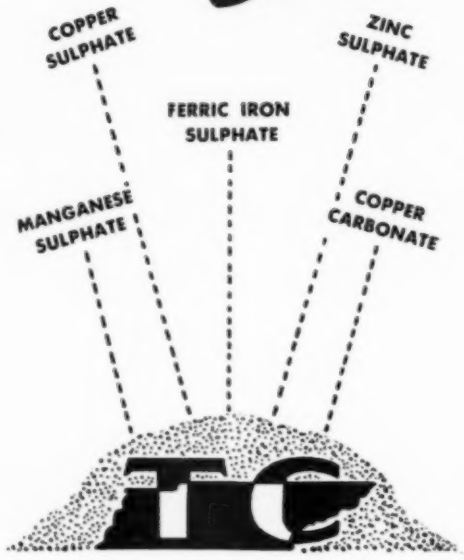

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- ★ ZINC SULPHATE
- ★ MANGANESE SULPHATE
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- ★ FERRIC IRON SULPHATE

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TENNESSEE TC CORPORATION
Atlanta, Georgia — Lockland, Ohio

Different areas of the United States use different grasses for grazing, but all of them use the same kind of plant food, making it impossible to misplace pasture fertilizers. Seeding practices for grazing crops must be followed just as seeding practices for row crops. Planting at the right time and the correct seeding rate are important.

Seedbed preparation is one of the secrets of getting good stands and we all know the secret of getting good growth is feeding it after it comes up. To keep the plants growing and good, the plant food must be kept up each year.

Pasture management is a big problem over the whole nation. Mowing is a must on all pastures. Chemical weed control may be included in future management of many grazing crops.

Millions of acres of idle land in the United States could be reclaimed and transformed into good grazing areas if the simple management practices were followed after the right amount of fertility has been placed in the soil. Too many areas of land are worn out in row crops and turned "out to pastures" instead of being *put in* pastures.

Oftentimes the question is asked, regarding the accelerating pasture program, "Aren't you going too fast and won't you make some mistakes with that speed?" We generally answer by saying, "If you go slowly enough to avoid all mistakes, you are going too slow to do any good."

Another good feature about Grassland Farming is that land not suited to row crops will grow good pastures without too much loss of soil by erosion.

The Experiment Stations over the nation have ready information to put into action on all phases of pasture establishment and management. Grasses and clovers have been selected by plant breeders and enough plants and combinations of plants are available to go into any area and make good. The greatest interest ever shown on pasture work is being demonstrated by all kinds of agricultural workers along with farmers and professional workers.

Pastureland is the safety belt of agriculture — it won't let you down.

PESTICIDES

(*Continued from Page 33*)

(b) Unless late blight of potatoes is controlled, the yield is seriously reduced and in epidemic years the loss may be disastrous. A widespread epidemic of late blight in Ireland resulted in a near famine.

(c) In the absence of use of fungicides to control cherry leaf spot the trees may be defoliated by midsummer. In addition to loss of fruit the tree may be so weakened that it will die during the winter or fail to yield fruit during the following season.

(d) The yield of anjou pears has been increased by 300,000,000 bushels per year by the use of fungicides.

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Herbicides

THE United States Chamber of Commerce has estimated that the annual cost of weed control is $3,000,000,000. The official definition for weeds refers to "plants growing where they are not wanted." Considering the many kinds of plants that grow where they are not wanted and the many situations where they may grow, it is not difficult to appraise the wide field covered by the term herbicide and appreciate the annual cost of weed control. Such plants as dandelions, crabgrass, thistles, ragweed, and wood shrubs are only a few well known illustrations of weeds. Lawns, among agricultural crops, on roadsides, railroad rights of way, in water ways, and under power lines are only a few of the numerous locations where kinds of plants grow where they are not wanted.

The use of chemicals to combat weeds is a field which is expanding rapidly. Advances in chemistry and engineering are making outstanding contributions to the problem of weed control. Labor and digging tools still provide means used to combat weeds of many kinds and in many situations. Some few kinds of weeds are also combatted by insects that destroy them. Classic examples being the use of a moth to control prickly-pear cactus in Australia and similar success with beetles to control Klamath weed in Australia and in parts of our western states.

Benefits from use of herbicides.— The development of new chemicals, especially those referred to as plant hormones, and their use as herbicides, has supplied numerous examples of the benefits that follow the use of chemicals to control weeds. Spectacular as some of these are, much is still gained by the use of other kinds of chemicals that have had general use over a long period. There are many factors that are used in appraising the benefits from the use of herbicides. That of saving labor is perhaps the most tangible and widely recognized.

During 1949 about 28,000,000 pounds of 2,4-D were used for weed control. The rapid increase of use of this class of herbicides is not surprising when we consider the large number of reported examples of benefits from their use. The following are a selected few:

(a) In 1948 it is estimated that farmers in the south central part of Canada used 2,4-D on some 7,000,000 acres and increased the yield of wheat by 21,000,000 bushels.

(b) The value of pastures in parts of Oklahoma was estimated to be increased by 20%.

(c) In North Dakota the yield of durum wheat is reported to have been increased from 15-53% by controlling mustard.

(d) In 1947 one county in Kentucky reported an increase in yield of corn worth $2,000,000.

(e) From Oregon there is reported an increase of 50% in the carrying capacity of pasture for beef cattle.

(f) In 1948 Kansas farmers saved much of their corn and small grain by controlling weeds which would have robbed these crops of moisture.

(g) Corn production was increased in parts of Iowa in 1948 by as much as 15%.

GRANULATION

(*Continued from Page 38*)

In the first-mentioned plant the dry mixture, recycled fines, ammoniating solution, and the major portion of the supplemental water required are fed continuously to the pug mill. The mixing and kneading action of the blades of the mill and the time the materials are retained permit completion of the ammoniation reactions, development of solution phase volume approaching the maximum, and some agglomeration. The partially agglomerated mixture enters the rotary granulator where agglomeration and compaction of the granule are substantially completed. From this point, with the exception of roto-louvre equipment for drying and cooling, the operations of sizing, dust collecting, processing of oversize, and gas scrubbing, are substantially like those practiced in the United Kingdom.

Summary

Rotary drying has been most widely adopted in processes for granulating mixed fertilizers. Although an agglomeration process involving rotary drying was first developed and placed into operation in the United States, the greatest commercial development in the granulation of mixed fertilizers to grade has been made in the United Kingdom where about 75 percent of the annual production of mixtures is in granular form. A flow-diagram of the granulation process and the various types of equipment used in each stage of its commercial application are discussed.

American practice in the formulation of mixed fertilizers differs from that of Great Britain chiefly with respect to the use in the United States of highly soluble salts and ammoniating solutions. The recent commercial application of the granulation technique to this formulation practice is described.

Results of past experiments on the comparative agronomic effect of granular and non-granular superphosphates and mixed fertilizers discloses the need for further agronomic research on this phase of the subject.

Acknowledgment — Grateful acknowledgment is made to members of the fertilizer industry both in the United Kingdom and in the United States for much helpful information, and to the Sturtevant Engineering Company Ltd. of London for the photographs.

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FERTILIZER APPLICATION

(*Continued from Page 49*)

Pilots, said Mr. McVickar, have difficulty in getting a uniform spread, which calls for better calibrated distribution devices. They also cannot carry large loads, so the more concentrated the fertilizer is, the more advantageous is it for distribution from a plane. He also suggested the desirability of radio communication between pilot and the ground to control distribution better. The airplane, he emphasized, does not compete with ground equipment, but supplements it, wherever it is impossible to get onto the land with ground equipment.

W. H. Johnson of Ohio State University also reported briefly on work with airplane distribution of fertilizer done at his station. There is a place where planes can be used satisfactorily, he said, but not all the questions involved have been answered.

Maurice H. Lockwood, vice-president, International Minerals & Chemical Co., Chicago, in discussing possible improvements in physical characteristics of fertilizer as aids to equipment manufacturers, emphasized two points:

Fertilizer of the future, he said, will contain more plant food and less moisture; and more granular fertilizer will be made and used. Use of more highly concentrated products, he said, will be due to the high freight rates on railroads and truck lines. Their areas of distribution will radiate at economical distances from their sources in Florida, Tennessee and the Utah-Wyoming-Idaho region.

Granulation, he said, is now only in its infancy, but will develop. Corrosion of metal parts of equipment is a problem, but this can be minimized when suitable corrosion-preventing coatings are developed.

Chief limiting factor in expansion of granular fertilizer, he continued, is the large investment required in production equipment. Some simple development in the granulation process may overcome this, but if this does not happen, granule manufacture will have to be restricted to larger manufacturers who can provide adequate capital.

Final feature of the day's program was a discussion of fertilizer application equipment design as the farm machinery manufacturer sees it. Participating in the symposium were C. E. Gulle, International Harvester Co., Chicago, and W. A. Hyland of John Deere-Van Brunt Co., Moline, Ill.

When farmers encounter difficulties with their equipment, both speakers agreed, in most cases the trouble can be traced to the fertilizer, rather than to the machine.

The great need, said Mr. Gulle, is for a fertilizer that will flow freely in all atmospheric conditions, at all times, whenever fertilizer is used. In addition to improved flowability, he listed, among other problems confronting manufacturers, such matters as the effect of change in humidity on fertilizer; corrosive action of the product; the tendency of mixtures of granular and fine ground fertilizers to segregate in the machine; and the foreign matter, from nails to paper, which gets into the bulk fertilizer unintentionally, but may clog and damage the equipment. Larger hoppers, demanded by farmers, he pointed out, will increase the price of machines. But most of all, he said, fertilizer manufacturers should standardize their products.

Mr. Hyland told how machinery manufacturers may design a machine, only to find before it reaches the market, that the fertilizer industry has created a new product that can't be used in the improved machine. He mentioned the difficulties sometimes encountered in loosening fertilizer in a machine and referred to one particular brand, which he said, cannot be distributed at all in the late afternoon when humidity is high. Such experiences, he declared, force farmers to shop around until they find a brand that gives them the least trouble. Repeating the previous speaker's demand for standardization of fertilizer products, he said this would mean better service to farmers.

R. M. Merrill of the John Deere-Van Brunt Co., Moline, Ill., was elected chairman of the National Joint Committee on Fertilizer Application for the coming year to succeed Dr. A. L. Lang, of the University of Illinois. New vice chairman is Dr. R. L. Carolis, of Michigan State College, East Lansing, Mich. The fall meeting of the Joint Committee, it was announced, will be held at Minneapolis, Minn., Sept. 4, 1951, in connection with the American Horticultural Society meeting there.

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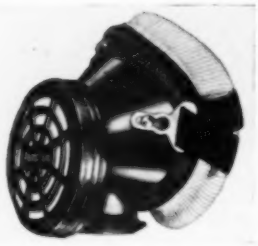

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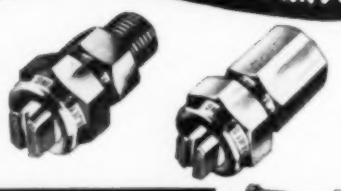

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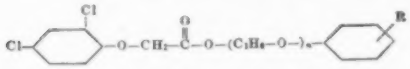
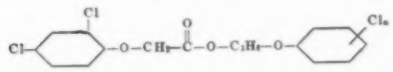
Industry Patents

2,523,187. Esters of 2-4D. Patent issued September 19, to Edgar C. Britton and Louis E. Begin, Midland, Mich., assignors to Dow Chemical Co., Midland, Mich. The esters of 2,4-dichlorophenoxyacetic acid having the formula: wherein

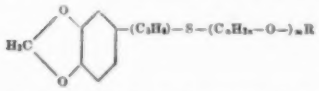


n is an integer not greater than 2 and R represents a member of the group consisting of hydrogen and the lower alkyl radicals containing from 1 to 4 carbon atoms, inclusive.

2,523,188. Esters of 2-4D. Patent issued September 19, to Edgar C. Britton and Louis E. Begin, Midland, Mich., assignors to Dow Chemical Co., Midland, Mich. The esters of 2,4-dichlorophenoxyacetic acid having the formula: wherein *n* is an integer not greater than 5.

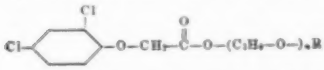


2,523,189. Esters of 2-4D. Patent issued September 19, to Edgar C. Britton and Louis E. Begin, Midland, Mich., assignors to Dow Chemical Co., Midland, Mich. The esters of 2,4-dichlorophenoxyacetic acid having the formula: wherein *n* is an integer not greater than 2, and R



represents an alkyl radical containing from 1 to 4 carbon atoms, inclusive.

2,523,233. Sulfur-substituted Mercapto-Dihydrosafroles. Patent issued September 19, to Edward A. Prill, Yonkers, N. Y., assignor to Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y. An organic compound represented by the formula where *n* is an integer 2 or



3, *m* is an integer not greater than 3, and R is an univalent radical of the group consisting of alkyl, aryl, alkaryl and aralkyl radicals, and nuclear mono substituted aryl, alkaryl and aralkyl radicals in which the nuclear substituent is a member of the group consisting of halogen and alkoxy; and in the above formula, there are not more than 26 carbon atoms.

2,523,420. Benzene Hexachloride Insecticide with Water Repellent Powdered Vehicle. Patent issued September 26 to Leslie James Burrage, Liverpool, England, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain. A dust-like water-repellent pest control composition comprising crude benzene hexachloride containing the gamma isomer, said benzene hexachloride being in intimate admixture with a non-alkaline water-insoluble solid diluent in powder form which has been rendered water repellent by coating the particles of said diluent with an oleaginous material.

2,524,728. Miticidal Composition Comprising Di - (4 - Chlorophenoxy) — Methane and the Dicyclohexylamine salt of 2,4-Dinitro-6-cyclohexyl Phenol. Patent issued Oct. 3, 1950 to Oscar H. Hammer, South Haven, Mich, assignor to Dow Chemical Co., Midland, Mich. A miticide composition comprising as active toxicants d-(4-chlorophenoxy)-methane and the dicyclohexylamine salt of 2,4-dinitro - 6 - cyclohexyl phenol, and wherein the toxicants are mutually activating and produce a synergistic effect as regards miticidal toxicity.

2,526,648. Noncaking DDT Powder Containing Carbon Black. Patent issued October 24, 1950 to William Vance Freed, Wilmington, Delaware, assignor, by mesne arrangements, to the United States of America as represented by the Secretary of War. A non-caking insecticidal powder concentrate comprising at least 85% by weight of finely divided 2,2-bis (parachlorophenyl) - 1,1,1 - trichloroethane having a particle size of less than 20 microns, and at least 2% by weight of carbon black having an apparent density of not more than .2 gram per cubic centimeter, said insecticidal powder being noncaking after exposure to a temperature on the order of 65° C.

2,528,151. Insecticides. Patent issued October 31, 1950 to Marshall Kulka, Ontario, Canada, and Herman D. Tate, Woodbridge, Conn., assignors to United States Rubber Co., New York, N. Y. An insecticidal composition having particular effectiveness for controlling mites and aphids comprising a poly (monochloromethyl) benzene and a surface-active dispersing agent.

2,538,493. Insecticide Comprising Rotenone and (Butylcarbityl) (6-propyl piperonyl) Ether as a Synergist Therefor. Patent issued November 7, 1950 to Leila Brannon, executrix, North Ingleside, Va.; dedicated to the free use of the People in the territory of the United States. An insecticide comprising from 0.1 to 0.75 percent, by weight, of rotenone and (butylcarbityl)- (6-propyl piperonyl) ether as a synergist therefor.

Trade Mark Applications

HERO, hand-lettered script, capital and small letters, for insecticides. Filed Feb. 3, 1950 by Bostwick Laboratories, Inc., Bridgeport, Conn. Claims use since April 1, 1948.

UNITROL, in capital letters, for use on a soil conditioner which reduces alkalinity and improves the texture of the soil for agricultural purposes. Filed June 11, 1948 by Union Oil Company at California, Los Angeles, Calif. Claims use since Feb. 16, 1948.

CUB, in capital letters with wide spacing, for peat moss used as a fertilizer. Filed Aug. 10, 1948 by Atkins & Durbrow, Inc., New York, N. Y. Claims use since Aug. 6, 1948.

JUBILEE, capital letters, for peat moss used as a fertilizer. Filed Aug. 10, 1948 by Atkins & Durbrow, Inc., New York, N. Y. Claims use since Aug. 6, 1948.

STIM-U-PLANT, in capital letters with hyphen close to "m" and "p", the "u" centered between these letters, for a plant food. Field Jan. 22, 1949 by Agricultural Laboratories, Inc., Columbus, Ohio. Claims use since Dec. 10, 1919.

SEMINOLE, bold face capitals and lower case, for plant fertilizing materials. Filed May 2, 1950 by Wilson & Toomer Fertilizer Co., Jacksonville, Fla. Claims use since November, 1894.

•

Ups Chlorine Production

Stauffer Chemical Co., New York, has announced an expansion program in chlorine production at its plant at Niagara Falls, N. Y. A 50% expansion was announced a year ago, and the additional capacity will bring total capacity to over 100 tons daily. The new output will be ready in from two to three months, it is said.

The substantial increase in chlorine demand, which has kept the commodity tight for several years, plus the company's increased production of carbon tetrachloride, led to the decision to step up the output.

Chlorine production facilities at the company's plant at Henderson, Nevada, have also been enlarged within recent months, Stauffer says. Other new plants of Stauffer's are at Houston; Tacoma; Lowland, Tenn.; and Los Angeles.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 25th of preceding month.

Positions Wanted:

Research-Sales: Technical background, several years experience in research work—evaluating insecticides, fungicides and herbicides. Extension experience. Farm background. Desires employment in technical sales or research in East. Address Box No. 494, care of **Agricultural Chemicals.**

Entomologist-Formulating Chemist. Experienced, research and development of household and agricultural insecticides. Exp. in making wettable powders, emulsion concentrates, dusts, aerosols and running bioassays. Experience in commercial field. Ph.D. in near future. Reply to Box No. 495, care of **Agricultural Chemicals.**

Sales Representative — Alabama: Currently employed by U.S. Public Health Service, in Malaria Control work. Graduate Sanitary Engineer desires change to chemicals or agricultural salesman. Well known throughout the state. Open to offer with reliable, aggressive concern. Would consider handling several non-competing products on manufacturers representative basis. Philip W. Holmes, 509 Adams Avenue, Montgomery 5, Alabama.

Chemical Engineer: Thirteen years experience in laboratory, production, and engineering: degree in chemical engineering. Can handle plant, production, organic and botanical insecticides: very much interested in sales. Address Box No. 496, care of **Agricultural Chemicals.**

Miscellaneous:

Sales Representation: Established sales agency covering mid-west area with headquarters in Chicago is in position to represent manufacturer selling chemicals or processing equipment to the agricultural chemicals, chemical specialty and allied industries. If interested in discussing the matter further, write to Box No. 497, care of **Agricultural Chemicals.**

Sales Representation: Eastern manufacturer agricultural chemical products will handle sale agricultural spray or other equipment effectively New England, New York, New Jersey as sales agent. Has plant with ample storage space and siding. Close contacts commercial growers. If interested, address Box 498, care of **Agricultural Chemicals.**

If You Are Contemplating relocating, you should request a copy of "Business Opportunities in Watertown, South Dakota." Call or write Mayor Gilbert or the City Promotional Director, J. G. Ihnet.

Surplus Chemicals For Sale: Paris green, calcium arsenate, calgreen. The Balcom Industries, Inc., Greeley, Colorado.

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Cites Nutrition Tests

C. H. Mahoney, secretary of the National Canners Association, Chicago, pointed out a number of interesting facts about the effect of fertilizers on the nutritive value of fruits and vegetables, in a paper presented at the recent meeting of the American Society of Agronomy at Cincinnati. In commenting on the use of organic vs. chemical fertilizers in relation to the nutritive value of the crop, he observed that "in majority of instances, these assumptions (that organic materials are superior) are not based upon comprehensive experimental results, but upon personal interpretations, without sufficient facts to justify definite conclusions.

He pointed out results of experiments on this subject, which had been conducted in 19 locations in seven states over a period of seven years. Purpose of the 30 experiments involved, was to determine the interactions between each element of the fertilizer, soil type, organic matter and season on mineral content. Results indicated that conditions of place caused 13 to 20 times more variation in calcium and phosphorus content of greens than fertility practice and that different fertilizer treatments varied with the season.

Other experiments, conducted separately, formed the basis for the same conclusion in measuring the vitamin content of vegetables. In four experiments, the influence of place was 13.75 times as great as the most important average effect produced by fertilizer treatment. These variations did not appear to relate directly to soil composition and the authors feel that sunlight and rainfall are probably the most important environmental factors, Mr. Mahoney reported.

•

Ammonium Nitrate Up $5.

The price of ammonium nitrate was to be advanced $5.00 a ton by two major producers on January 1.

CONSULTING ENTOMOLOGIST

Insecticides — Formulation
Plant Pathology—Research
Entomology—Legal Service

Author of
"Chemistry & Uses of Insecticides"

DR. E. R. de ONG
926 Stannage Ave. Albany 6, Calif.

Theodore Riedeburg Associates

Sales Consultants
and
Manufacturers' Representatives
on
Agricultural Chemicals

Sixty-third Floor, Chrysler Building
New York 17, New York
MUrray Hill 4-4731

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street
Palo Alto, California

FLORIDA FIELD TRIALS

Testing agricultural chemicals in the field during the winter months.

DR. G. R. TOWNSEND
P. O. Box 356
Belle Glade, Florida

Controls on the Way

By C. C. Campbell

Controls are coming sooner and probably more drastically than many persons think. "Voluntary" controls are only a stop-gap, with the real thing to be imposed almost immediately.

All government departments are studying sources of supply, availability of materials, possible substitutes, diversion of some supplies from one industry to another, and the problem of how to supply the military needs without disrupting the home front.

The particular importance of chemicals in the considerations is well recognized. Gen. McAuliffe of the Army Chemical Corps. states that victory in war will go to the nation with the best chemical industry, both for military production and food supplies.

Benzene and sulfur supplies are getting much attention, with the National Production Authority requesting a "task force" of benzene producers to study supply and demand prospects for next five to ten years so a realistic basis may be formed to estimate needs for synthetic benzene from petroleum. Benzene demand has increased 40% in four years and it is estimated that nearly twice present production will be required by 1955.

The Bureau of Mines is pushing studies on increasing availability of benzene from coke ovens. The Bureau has proposals for two oil-from-coal plants, which would step up benzene production by 20%. Oil companies are also being urged to build additional facilities with government loans.

Sulfur Studied

NPA has warned the Sulfur Industry Advisory Committee that a consumption limitation order and export controls are under consideration. Demand for sulfur in 1951 will exceed supply and formal action is deemed necessary to maintain equitable distribution at home and abroad. Some sulfur may be stockpiled for future emergencies, it was indicated. At the same time it is estimated in Washington, that sulfur output may reach 5 million tons in '51, nearly 2½ times 1939's production.

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Insect Control Conference

The Agricultural Extension and Research groups, as well as industrial groups in Louisiana jointly planned the 1951 Louisiana Insect Control Conference which was to be held on January 9th and 10th, at the Bentley Hotel, Alexandria, La.

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(The Advertisers' Index has been checked carefully but no responsibility can be assumed for any omission)

TALE ENDS

HOW pleasant it is at the holiday season to receive in the daily mail cheery greetings from friends and business associates in various parts of the country! We wish it were possible to acknowledge personally, all of the Christmas cards received by the staff of Agricultural Chemicals, but this seems impossible. To one and all, a hearty "thanks", and our own best wishes for a fruitful 1951!

■

Easy Going...

WHEN we're snowed under with orders and selling is a lead-pipe cinch, that's when many a wisenheimer thinks it's time to cut down the advertising. It's easy to coast. But when the uphill sales pull begins again, that's when advertising done during the easy days really pays off.

If you would keep on selling the field of chemicals for agriculture when things get tough again, then we suggest that you keep on advertising now in

AGRICULTURAL CHEMICALS

254 WEST 31st STREET NEW YORK 1

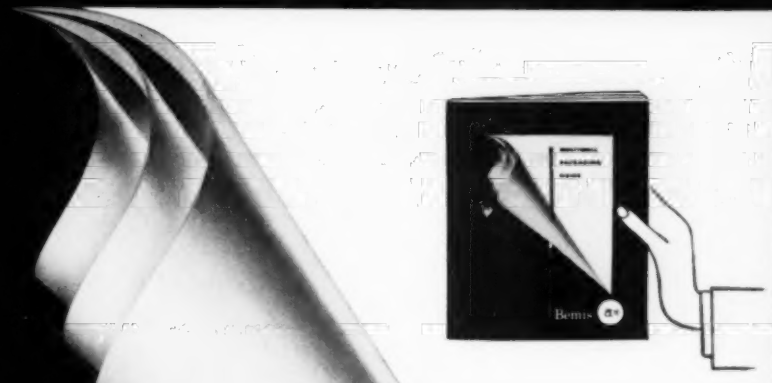
The voice of Dr. Morton S. Biskind was heard again in recent testimony before the Select Congressional Committee in Washington. Dr. Biskind, whose newspaper articles against the use of DDT brought much notoriety a couple of years ago, is sticking to his former theme, viz, DDT causes virus X. Stating flatly that the Food and Drug Administration, the Federal Security Agency and the U. S. Department of Agriculture are wrong in saying DDT is not harmful to humans in the minute amounts which may remain on foodstuffs, he declared that DDT may affect heredity adversely and cause psychological derangement.

One patient he knew of, Dr. Biskind added, developed suicidal depression after heavy exposure to DDT spray. For months he was treated without success but when DDT was removed from his environment, his depression vanished.

(Possibly the victim was a salesman of chlordane, lindane, or parathion).

•

The date was November 1, 1950, the time was late afternoon, and the place, Washington, D. C. L. W. Kephart, formerly in charge of U.S.D.A. weed investigations and now agricultural advisor for the World Banking Organization, had just ridden past Blair House, in a trolley. Alighting a couple of blocks away, and hearing police sirens screaming from all directions, he wondered what all the excitement was about. A policeman, seeing Mr. Kephart standing at the fringe of the crowd, dashed up to him, grabbed his arm and said in excited tones, "Here . . . quick, get out of sight and come along with me!" The puzzled Mr. Kephart had been mistaken again for President Truman, to whom he bears a fairly close resemblance. With would-be assassins at large at that moment, the policeman was sure he was shielding the Chief Executive from harm. Once apprised of the situation, Kephart quickly informed the red-faced officer of the mistaken identity.



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WHAT'S THE ONE SURE WAY TO Stop Flies WITHOUT DANGERS OR DIFFICULTIES?

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Give *your* dairy insecticides these sales "pluses." Base them on Pyrenones and cash in on the hard-selling nationwide advertising, publicity, and promotion campaigns that are keeping Pyrenone-based insecticides *first* in the minds of *your* customer — the dairy farmer.

For information, write: *U. S. Industrial Chemicals, Inc., 60 East 42nd Street, New York 17, New York. Branches in all principal cities.*

Pyrenone*

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